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25th Session International Railway Congress Highlighted

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25TH SESSION INTERNATIONAL RAILWAY CONGRESS HIGHLIGHTED

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25TH SESSION INTERNATIONAL RAILWAY CONGRESS HIGHLIGHTED

[Selected Articles from ZHELEZNODOROZHNYY TRANSPORT No 4, Apr 89]

On the Eve of the International Forum of Railroad Workers

18290186a Moscow ZHELEZNODOROZHNYY TRANSPORT in Russian No 4, Apr 89 pp 1-3

[Article by N.S. Konarev, USSR Minister of Railways: "On the Eve of the International Forum of Railroad Workers"]

[Text] Over 150 years have passed since the first railroads appeared. Railroad transport has steadily increased its importance in creating and intensifying its economic potential and in accelerating the development of the productive forces of the world community in proportion to its dynamic development. Today the world network of railroads is an important unit in the world transport system. It stretches for about 1.1 million kilometers. The average yearly world freight turnover is about 7,400 billion ton-km, and for passenger turnover is 1,800 billion passenger-km. The underground railways—the subways—transport 17.7 billion passengers a year. The success of a number of countries in organizing the transport process and developing rapid passenger traffic shows that in using the modern achievements of scientific-technical progress, the steel roads are fully competitive with both motor vehicle and air transport.

Railroad transport plays a special role in our country. It carries out over 60 percent of the domestic freight turnover and over 40 percent of the passenger transport in intercity and suburban service. The reasons for this high level of transport work are the unprecedented length of the transport arteries, and the location of most of the industrial and agrarian centers far from marine aquatoriums and waterways, the meridional direction of practically all the navigable rivers, the emergence of most of the waterways into the polar basin with a brief navigation season and the contrasts of climatic zones and regions.

Therefore, it is not by chance that the total length of the railroads is 146,100 kilometers, which constitutes only 12 percent of the length of all the railroads in the world, and that USSR railroad transport fulfills 53 percent of the world railroad freight turnover and one-fourth of the world passenger transport volume. This dictates the high intensification of the operations work—today the freight-intensiveness on our country's most important lines reaches 150 million tons a year.

USSR railroads are distinguished not only by high freight-intensiveness, but also by highly intensive use of technical devices and the very high rolling stock productivity. Labor productivity on the Soviet railroads is one of the highest in the world, and the cost of freight transport is one of the lowest. This confirms the great economic effectiveness of railroad transport in our country.

The railroads of the Soviet Union are constantly developing and improving. In just the last three years, 2,800 kilometers of new lines and over 4000 kilometers of secondary tracks have been put into operation, 4500 kilometers of freight-intensive mainlines have been electrified, and 11,200 kilometers of main tracks have been equipped with automatic block signal systems and dispatcher centralization. 1989 will become the year of the start of regular operation of the Baykal-Amur Mainline—the largest new railroad structure in the world in the second half of the 20th century. The social orientation of the development of railroad transport is increasing. In 1981-1988, over 15 million square meters of housing was constructed for the railroad workers, including 140,000 apartments in the last three years. By the year 2000, at least 247,000 apartments are to be put into operation for railroad transport. This will make it possible to provide an individual apartment for practically every railroad worker family.

Under the conditions of the creative processes of restructuring taking place in the USSR, Soviet railroads will continue to develop and improve steadily, primarily because they are the country's main transport system. It is the most economical and convenient means of delivering mass freight and production output, operating reliably under any weather conditions and in any climatic belts, ensuring the efficient work of the entire national economic complex. Developing a network of railroads and intensifying their throughput and carrying capacity are to a considerable extent linked with the economic development and increased industrial potential of the eastern and northern regions of the country. The development of a program of radical modernization of Soviet railroad transport for the years 1991-2000 is presently being completed.

At the forthcoming 25th Session of the International Railway Congress Association, important and topical problems of increasing the efficiency of railroad work will be discussed. Soviet railroad workers were gratified to accept the decision to hold the Session in our country. It is extremely important for Soviet railroad specialists to analyze and study the world experience of railroad transport organization. I am sure that the plenary session, section and round table discussions of the advanced directions of railroad transport development will help the railroad and industrial workers to find new, more efficient solutions to organizing passenger and freight transport.

I hope that the Moscow congress will be another step in the development of scientific-technical progress in railroad transport. Permit me to extend a heart-felt welcome to the participants in the Congress and the persons accompanying them—the guests of our capital.

The 25th Session of MAZhK [IRCA]: Aims and Approaches

18290186b Moscow ZHELEZNODOROZHNYY TRANSPORT in Russian No 4, Apr 89 pp 2-4

[Article by L. Verberkt, general secretary of MAZhK [International Railway Congress Association] (IRCA)]

[Text] The International Railway Congress Association is one of the oldest organizations of railroad collaboration, which marked the 100th anniversary of its founding at its 24th session in Brussels in 1985. The purpose of the organization, its chief task, is to gather and distribute special information on the problems of railroad transport management. Included here are operational, technical, economic, commercial, ecological and social problems. For this purpose, the Association carries out three types of activity: holding periodic sessions on global subjects, topical for all members of the IRCA; organizing, in the periods between the sessions, seminars for the study of less general problems, which are of interest for specialists in a certain specific field; publishing the monthly journal, "Railroads of the World."

To organize the sessions and edit the journal, the Association works in close contact with the International Union of Railways, with which it concluded an appropriate agreement in 1969. In order to distribute information more widely, the Association maintains ties not only with organizations engaged in railroad operation (state and private), but also with governments, organizations and private associations that are related to railroad transport. It is widely open to discussions.

Selecting the topics to be discussed is a very complex task. In the last few years the number of seminars and symposiums held have considerably increased, and they have acquired a commercial nature. At the same time, these measures should help specialists to have a free exchange of ideas and information on neutral territory and work out decisions pertaining to the role of railroads in the transport system and the use of new equipment in order to create the best conditions for consumers, society and the environment.

In consideration of the above-mentioned factors, the theme of the 24th IRCA Session, which took place in May 1985, was formulated in this way: "The Place of Railroads in the Transport System at the Dawn of the 21st Century." Such a broad theme should undoubtedly call forth and did call forth numerous reports and discussions on problems of transport policy on the part of government, nongovernment and also international organizations.

The 24th Session was totally devoted to discussing the situation of railroads in the world and the perspectives for their development. A number of important conclusions were drawn as a result. Let us name some of them.

"The main role of state authority in transport policy consists of evening out, in so far as is possible, the conditions for competition between various types of transport. In many countries this difficult task involves the work and leisure conditions of the operating personnel, expenditures for construction and routine maintenance of the technical means of transport."

"The transport market continues to develop rapidly. At the same time, new structures are being created, including technical achievements contributing to a rise in labor productivity, modern methods of management and financing and commercial service."

"The time of 'all-purpose transport enterprises' is decisively over. From now on each enterprise should precisely determine the need of its clientele, the advantages which it has over others in offering services, and the quality and cost of transport. Efforts should be concentrated in this precise direction."

Throughout history, with all political regimes and under any economic conditions, "internal" profitability has served as the basic criterion for choosing and operating transport systems. Both in the 19th century and at the beginning of the present century, railroads unswervingly followed this rule. Later the concept of profitability expanded, and in many spheres of activity, sometimes even far from transport, any evaluation laying claim to completeness began to include a number of external factors, including accidents, environmental pollution, land management, etc.

In accordance with this, not only in countries with a market economic system, but also in those where it is of a fully planned nature, each project with considerable investments is at present undergoing a two-fold evaluation: for the internal profitability, which primarily interests private investors and international financial organizations, and also for profitability including external factors, which pertains more to organs of state authority.

This principle, which IRCA took as a basis beginning with the 22d Session, held in Stockholm in 1979 on the theme, "Capital Investments as the Basic Factor in the Development of the Railroads," was recently used in application to three extremely important, mutually supplemental projects. Attached to developments already existing or in the stage of development, they will create a truly great achievement for our time in the sphere of transport—a Western European high-speed railroad network. It is a question of projects for which there are already governmental decisions. These are—a tunnel under the English Channel, lines—Paris-London- Brussels- Cologne-Amsterdam and lines—Seville-Madrid-Barcelona-the French border. It is known that construction of the tunnel will be financed by private capital. It is possible that some sections of the European Northwestern line will also be financed in this way. With the exception of the tunnel, the operation of the new infrastructures will be provided by the corresponding railroads. It is intended to put the complex into operation in 1993. On the other hand, by the end of 1992, the 12 countries of the European Community will form a Common Market without internal boundaries.

All these events in the next five years will considerably change the European transport market in the sphere of both passenger and freight transport. The railroads have a number of advantages for preparing for this properly in the period stipulated. We must not forget, however, that their competitors, particularly motor vehicle transport, also have their own specific merits.

In railroad transport, an indispensable condition for increasing labor productivity, expressed in terms of transport work per employee per year, is ensuring the regularity of the transport process while increasing both the volume of products transported and the distance of its delivery. While in countries with extended mainlines both these factors often act simultaneously, in Western Europe, because of the relatively small territory of its countries, this situation is rarely observed. This is partially because of the fact that labor productivity in freight transport in the Western European countries is two-three-fold lower than, for example, in the United States or the USSR.

Regardless of the conditions in these or other countries, however, an intensified study of methods of increasing productivity is a common, necessary goal. In the developed countries, the evolution of economic structures directed toward creating highly organized service, as well as the progressive development of highway and air transport, require from classic or new types of railroad transport constant satisfaction of the various needs of passengers, with maximum economy. To a certain extent this is also true of the developing countries. In these countries, however, the problem of financing (for example to modernize obsolete equipment) is regarded as another keystone, and has its own specific difficulties.

Selecting the most effective methods of increasing productivity in many ways depends on the specific features of specific railroads. The international Session, in the work of which domestic representatives and experts from various countries are taking part, offers an excellent opportunity for comparisons in this sphere. That is why the Committee of the IRCA administration included on the agenda of the 25th Congress, the meetings of which will be held in Moscow from 22 to 26 May, problems of increasing the productivity of the operations process in railroad transport.

Increasing productivity will unquestionably contribute to the financial health. This is not enough, however, to ensure profitability and "survivability." Offering, even under the most favorable conditions, services that no one needs leads any transport enterprise only to failure. This applies completely to the commercial activity of a railroad, including the social types of service which it is offering at present.

In the course of the last few years, the financial indicators of many railroads have steadily deteriorated. This is the consequence not only of insufficient productivity, but also of the inability to adapt to the real conditions of the modern transport market. In a number of countries with market economics, it has become impossible for many railroad enterprises to pay taxes and debts. This has made some governments adopt extreme measures, an example of which is the denationalization of Japanese railroads. Other railroads have concluded "productive contracts" or special agreements with their governments, within the framework of which mutual obligations are accepted for a certain period. For operations enterprises, these obligations primarily pertain to the profitability of the commercial services.

The present moment is particularly successful for widescale international compilation of ways and methods of increasing productivity, already introduced or being studied by various member-railroads of the IRCA. The administrative committee of our Association has decided that the next meeting would be devoted to improving passenger and freight transport in general.

Soon, in the 25th Session in Moscow, we will discuss the basic theme, "Improving the Transport Process and Raising Labor Productivity in Railroad Transport." The discussions which will take place in May will be oriented particularly toward the analysis of measures which each railroad must adopt to ensure future success. I assume that this theme will interest the representatives of the organs of state authority as well. We are sure of the success of the forthcoming work.

Permit me in concluding to give warm thanks to the Soviet administration for its courteous invitation to the meeting in Moscow, and for the efforts which they are making to organize it.

We Present the Members of the IRCA

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[Article]

[Text] **As of 1 January 1989, 79 railroad administrations, 29 representative administrations, 29 representative organizations and 16 international organizations were members of the IRCA.**

The Association includes representive organizations of Argentina, Belgium, Bolivia, Bulgaria, Denmark, Egypt, Spain, Finland, France, Great Britain, Greece, India, Italy, Luxembourg, Norway, Pakistan, Paraguay, Holland, Peru, Poland, Portugal, Romania, Sweden, Switzerland, Tunis, Venezuela, Vietnam and Yugoslavia.

There are 27 railroad administrations, including the Soviet railroads and the railroads of Hungary, Poland, Czechoslovakia and Yugoslavia, which are permanent members of the Executive Commitee of the IRCA.

The total extent of the railroads encompassed by the International Railway Congress Association is over 616,000 km. The Association includes the states of Asia, America, Africa, Australia and Europe.

The International Railway Congress Association [IRCA] was founded on 13 December 1884 in Brussels at the First Scientific Congress of Representatives of Railroad Administrations and Governments, convoked on the occasion of the 50th Anniversary of the day of founding the first Belgian Railroad. The organization obtained its actual title on 15 September 1919.

The purpose of the IRCA is to contribute to the development of railroad transport and its technical progress, improve the scientific research work in the field of transport and intensify the exchange of experience through the sessions held periodically on topical themes, and also to provide the members of the organization with broad information on the problems of the development of transport and publish scientific-technical surveys.

The members of the Association can be representatives of member countries or railroad administrations, operating surface or underground transport extending at least 100 kilometers, with an average yearly income of at least 2 million gold francs for the period of the last three years and having any legal status for their activity. Therefore, in accordance with the IRCA Bylaws, its members may number over 100 countries. In addition, the members of the Association may include international transport organizations, as well as national railroad unions of countries, which are combined and direct the activity of the administrations without being members of the IRCA. At the same time, the unions should control at least 5000 kilometers of tracks or at least 10 percent of the country's entire railroad network.

In our country, membership in IRCA is conferred upon the USSR Ministry of Railways.

Of the 16 international organizations on the Directing Committee of IRCA, two are permanently represented: the Association of American Railroads and the International Union of Railroads. In the Directing Committee of IRCA, which is one of the leading organs of the Association, representatives of the governments of Belgium, Bulgaria, Egypt, France, Great Britain, India, Italy, the Netherlands, Poland, Portugal, Romania, Spain, Switzerland and the CzSSR are permanent members.

Asia

Railroad Corporation of Burma. The extent of the railroad network is 3137 km, with a track gauge of 1000 mm. The railroads in the country were built in the period from 1896 to 1928 by the Indian government and until the separation of Burma and India in 1937 were operated alternately by private companies and by the national administration of India. Beginning in 1937, Burmese railroads obtained autonomy, and since 1972 have been controlled by a national Corporation. The freight turnover in 1984 was 503.8 million ton-km, and the passenger turnover—3586 million passenger-km. The technical base of the Corporation: 141 steam locomotives and 229 diesel locomotives, 13 diesel-trains, 1333 passenger and 8949 freight cars.

Railroads of the Socialist Republic of Vietnam. The first line, from Saigon to Mito, was opened in 1885. Up to 1936, a number of lines were built between Hanoi and Saigon (now Hoshimin). After reconstruction, completed in 1977, the SRV railroad network was split into three roads: the Northern, Central and Southern. The total extent of the network is 2600 km, including 2200 km of track 1000 mm wide (the remaining sections are 1435 mm). Some 106 steam locomotives and 98 diesel locomotives, 600 passenger and 3500 freight cars are in operation on the network. Up to 10 million tons of freight and up to 50 million passengers are transported yearly.

Railroads of India. India's railroad network numbers 61,850 km, including 33,553 km of 1676 mm gauge track, 24,051 km (1000 mm) and 4246 km (610 and 762 mm). Some 6440 km of wide-gauge track and 166 km of meter-gauge have been electrified. The network uses mainly a power supply and electrification system of 25 kV alternating current, but sections of 1.5 kV direct current are also encountered.

After the country's railroads were nationalized (1944), a process of integrating the separate networks was implemented, and by 1952, six railroad zones had been formed under the management of the government administration. At present, nine administrative zones are functioning in India, carrying out the current operation of the railroad network. The National Board of Railroads is studying the problems of carrying out a unified technical policy and current and long-range planning and control of the activity of the zonal administrations.

In the period from 1986-1987, the railroads yearly transported up to 3580 million passengers (passenger turnover of 256,468 million passenger-km), the yearly freight turnover was 223,100 million ton-km, and an average of 307 million tons of freight was transported.

There are 4950 steam locomotives, 3182 diesel locomotives and 1366 electric locomotives in operation on the network of roads. The fleet of rolling stock also has 2988 half train sections, 37,997 passenger cars of various classes and 354,018 freight cars and flat cars.

Railroads of Iraq. Railroad building began in Iraq in 1902, as part of the project of the intercontinental railroad mainline, Berlin-Istanbul-Baghdad. In 1983, construction was completed of the section, Baghdad-Huseiba on the border with Syria. The Transiraq Mainline was thus put into operation. Construction of a number of other lines is planned, chiefly in the meridional direction, with a total extent of 2400 km. At present there are 2029 km of railroads operating in the country, including 1496 km with a track gauge of 1435 mm and 533 km with a track gauge of 1000 mm.

According to the statistical data for 1986, the freight turnover was 1360 million ton-km, and for passenger turnover—1005 million passenger-km. Iraq's railroad network has in operation 437 diesel locomotives, 575 passenger and 12,357 freight cars for standard track, and

73 steam locomotives, 64 passenger and 2262 freight cars for narrow-gauge track.

State Railroads of Iran. The first section of Iranian railroads, the construction of which was completed in 1938, linked the Persian Gulf with the Caspian Sea, and its northern section, adjacent to USSR territory, initially had a track gauge of 1524 mm. The planned development of the railroads made it possible to have them link the main economic and historic regions of Iran. In 1958, the Teheran-Dzjulfa line connected the railroad systems of the USSR and Iran and in 1971 an exit to the Turkish railroads was implemented. A separate line with 1676-mm tracks connects the Iranian city of Zahedan to Pakistan. Construction of the section, Kerman-Zahedan, 560 km long, is planned for completion by 1992, which will make it possible to unite Iran's railroad network laterally and realize the project of a Transasiatic railroad on its Western and Central sections. With the technical support of the USSR, in 1982 the first section of the Iranian railroads between Tebroz and Dzjulfa was electrified. Next will be electrification of the line to Mashhad and to the Port of Bandar-Abbas in southern Iran.

The total extent of the railroad network is 4567 km, including 4473 km with a track gauge of 1435 mm and 94 km of track 1676 mm wide. Some 146 km of track have been electrified, using a 25 kV alternating current. The cargo turnover of Iran's State railroads in 1985 was 6841 million ton-km, and for passenger turnover—5682 million passenger-km. The fleet of rolling stock numbers 526 diesel-electric locomotives and 8 electric locomotives (in addition, 10-20 electric locomotives are leased in the USSR), 982 passenger and 12,020 freight cars of various types.

Railroads of Campuchea. Construction of the first two sections of railroads on the territory of what was then Cambodia dates back to the 1930's-1940's. In 1952 all the roads on the territory of the state were combined into a unified system of Cambodian railroads. In the years of the national-liberation war, the railroad tracks, locomotives and rolling stock were mainly destroyed. By now, however, many sections have been restored and, according to press reports, passenger and freight traffic has been set up, mainly using steam locomotive hauling. In 1986 up to 1 million passengers and 131,700 tons of freight were transported. The extent of the railroad network is 570 km with a track gauge of 1000 mm. It is reported that up to 20 steam locomotives, 13 diesel locomotives and about 500 cars are operating.

The Railroad Administration of Taiwan. The first railroad line in Taiwan was put into operation in 1891. The western sections, the construction of which was completed by 1908, were partially electrified in 1979. In the east of the island, a line with a track gauge of 762 mm operated in isolation from the rest of the network, but by 1982 it was regauged to a track, common for Taiwan, 1067 mm wide, which made it possible to create a unified island railroad network 1087 km long.

In 1985 the Taiwan railroads carried 130.8 million passengers (passenger turnover of 8299 million passenger-km) and 17.8 million tons of freight (freight turnover of 2185 million ton-km). Some 498 km were electrified, using a 25 kV alternating current. The fleet of rolling stock consists of 179 diesel locomotives, 112 electric locomotives and 36 steam locomotives, 121 diesel sections and 13 suburban electric trains, 1440 passenger and 7072 freight cars of various types.

State Railroads of Lebanon. Since 1961 all the railroads in the Lebanon have belonged to the state. During the civil war in the country the system of railroad transport as a unified whole was destroyed, and only individual sections of the country's railroads are in regular operation. The extent of the State railroads of Lebanon is 222 km, and the track gauge is 1435 mm. Operating on the network are 11 steam locomotives and 9 diesel-electric locomotives, 9 passenger and 585 freight cars.

Malaysian Railroads. The first railroad lines on the Malay Peninsula were put into operation in 1885, and a century lighter, in 1985, construction of a new branch was approved—from the capital, Kuala Lumpur, to the east. In 100 years Malaysia has built and is operating 1639 km of 1000-mm tracks, which connect the country with Thailand on the north and Singapore on the south. The economic difficulties recently experienced by the Malaysian railroads have led to a striving to denationalize them, which has often been discussed in the world press.

In 1986 the country's railroads transported 2.8 million tons of freight, and the passenger turnover was 6735 million passenger-km. One steam locomotive, 92 diesel locomotives, 322 passenger and 4448 freight cars are in operation.

Syrian Railroads. Syrian railroads encompass all the country's railroad lines with standard track (the narrow-gage network is operated by a different company). In the 1970's, construction of new lines to the south and east from the railroad junction at Homs was activated. For example, in 1983 the section from Homs to Palmyra, 150 km long, was put into operation. There are plans to build the section, Tartus-Latakia (80 km), before 1990, and the possibility of an exit to the Iraqian railroad network at Huseiba is stipulated for the future.

The total extent of the Syrian railroads is 1686 km of standard track. In 1986 the passenger turnover was 893 million passenger-km, and the freight turnover was 1417 million ton-km. Some 3.3 million passengers and 5.1 million tons of freight were transported. There are 186 diesel locomotives, 10 diesel sections, 488 passenger and 4274 freight cars in operation.

State Railroads of Turkey. The first railroad section was built in 1896. Private railroad companies were engaged in the construction of railroads on the Asian territory of Turkey, but by 1935 the state bought them out, and by 1937 also acquired the railroads on the European territory of Turkey. In 1953 the State railroads of Turkey

were formed as a unified nationalized corporation. The extent of the network is 8401 km with a track gauge of 1435 mm. The line connecting the European and Asian shores of the Bosphorus bay between the cities of Cerkeskoy and Arifi, 479 km long, was electrified using 25 kV alternating current, and the suburban sections near Ankara were also electrified.

According to 1986 data, the State railroads of Turkey transported 129.3 million passengers and 13.7 million tons of freight. The passenger turnover was 6052 million passenger-km, and the freight turnover—7219 million ton-km. Passenger and freight transport is provided by 552 diesel locomotives and 18 electric locomotives, 86 half train sections and 24 diesel-trains, 1502 passenger and 20,468 freight cars.

National Railroads of the Philippines. The first private line of the railroads in the Philippines was put into operation in 1892 on the island of Luzon. By 1917 the State had already bought it out. In the years of the second world war, the railroads were considerably damaged, but in a few postwar years they were fully restored. In 1964 a corporation of the National Railroads of the Philippines, managed by the State, was formed to coordinate the management of the island railroads. This corporation now also manages the network of bus lines in the country.

The length of the railroads on the islands of Luzon and Panay is made up of 797 km of track 1067 mm wide. In 1983, 7.5 million passengers (passenger turnover of 245 million passenger-km) and 17.3 million tons of freight were transported on the network. The railroads are equipped with 84 diesel locomotives, 108 diesel-trains, 250 passenger and 924 freight cars.

National Railroads of Japan. On 1 April 1987, the formerly unified National Railroads of Japan split into six companies, operating passenger lines, two companies which perform freight transport on a country-wide scale, and the Sinkansen Corporation, which hires out transport equipment and property to a number of railroad companies, as well as four auxiliary companies, related to the railroad sphere. Collectively, all the companies linked with operations activity adopted the common title of "Japanese Railroad Group," but in the economic respect these are independent, separate railroad systems.

The Hokkaido Railroad included the roads of the National Railroads of Japan which were located on the island of Hokkaido. They are 2542 km long, with a track gauge of 1067 mm. Passenger turnover in the 1986/1987 economic year was 3600 million passenger-km. The technical equipment was: 102 diesel locomotives, 50 electric locomotives, 176 half train sections, 572 diesel-trains and 539 cars of various types.

The East Japan Railroad includes the lines located in the Tokyo region. The total extent of the network is 7454 km, with track gauges of 1067 mm and 1435 mm. The passenger turnover is 99,400 million passenger-km. The road has 277 electric locomotives and 190 diesel locomotives, 9504 half train sections, 688 Sinkansen express-line cars, 733 diesel-trains and 1835 cars of various types.

The Central Japan Railroad encompasses the lines to Nagoya and its vicinity. The lines are 1984 km, with track gauges of 1067 and 1435 mm. The passenger turnover is 38,400 million passenger-km. It is equipped with 9 electric locomotives and 29 diesel locomotives, 1007 half-train sections, 218 diesel trains, 1458 Sinkansen express-line cars and 329 cars of various types.

The West Japan Railroad includes lines of the Hokuriku region and western Honshu. The length of the lines is 5091 km (tracks of 1067 mm and 1435 mm), and the passenger turnover is 45,300 million passenger-km. The rolling stock numbers 61 electric locomotives, 144 diesel locomotives and 5 steam locomotives, 3814 half train sections, 845 diesel trains, 715 Sinkansen express-line cars and 1320 cars of various types.

The Shikoku Railroad encompasses the part of the National Railroads of Japan located on the island of Shikoku. The extent of the lines is 837 km, the track gauge 1067 mm, the passenger turnover 1500 million passenger-km. The equipment: 37 diesel locomotives, 339 diesel trains, 38 half train sections and 119 cars.

The Kyushu Railroad encompasses the lines located on the island of Kyushu. With a length of 2101 km (track gauge 1067 mm), provides a passenger turnover of 6900 million passenger-km. It has 43 electric locomotives, 22 diesel locomotives, 901 half train sections and 518 cars of various types.

The Japanese Freight Railroad is a company providing freight transport throughout the territory of Japan, through owning six railroads. The company serves 9886 km of lines with a track gauge of 1067 mm, and it owns 534 electric locomotives and 291 diesel locomotives, as well as 17,525 cars to transport various types of freight. The freight turnover is 54 million ton-km.

Among the auxiliary companies singled out from the National Railroad of Japan may be included the Railway Telecommunications Co. Ltd., the Railway Information Systems Co. Ltd., the GNR Accounts Settlement Corporation and the Japan Scientific Research Institute of Railroad Equipment.

State Railroads of Indonesia. The first line began operation as far back as 1864. Up until 1939, about 40 percent of the length of the national railroads belonged to private corporations and firms. In the years of the Japanese occupation, a large portion of the 1435 mm gauge track was converted to 1067 mm gauge, and now it is track of this gauge that is standard for the country, with the exception of the secondary narrow-gauge sections on the islands of Java and North Sumatra. After the war was over and the revolution had taken place in Indonesia, the State nationalized all the lines on the islands of Java, Madura and Sumatra. The connection between the

islands was made by ferries, also belonging to the railroad administration. Making ferry and railroad connections with Singapore will make it possible in the future to extend the Transasiatic Railroad Mainline to the island of Indonesia.

The extent of the State railroads of Indonesia is 6877 km, including on Java—4922 km with a 1067 mm track gauge and on Sumatra—1458 km with a 1067 mm track gauge and 497 km with a 750 mm track gauge. A section 125 km long was electrified, using direct current with a voltage of 1.5 kV. In 1985-1986 the freight turnover was 7047 million ton-km, and the passenger turnover—4877 million passenger-km. Transport is provided by 31 steam locomotives and 518 diesel locomotives, 146 diesel trains and 25 half train sections, as well as by 3089 passenger and 37,848 freight cars.

Australia

The Railroads of the State of Victoria are a member of the IRCA. This is the oldest transport system on the continent. The first section, connecting the Port of Melbourne with the city center, was launched for operation in 1854. Since 1983 the Victoria Lines have combined the National Railroads of Victoria, the suburban lines of Melbourne and a number of companies serving municipal public transport and the subway. The Victoria Lines system included in the IRCA is only one of the nine national railroad companies which, as a rule, are administratively divided according to the individual states of the country.

The Victoria Lines include 5448 km of 1600 mm gauge track (of them, 452 km are electrified with 1.5 kV direct current) and the Melbourne-Albury section (332 km), on which tracks of 1435 mm and 1600 mm are laid parallel. The line operates 289 diesel locomotives and 25 electric locomotives, 356 passenger and 10,432 freight cars, as well as 662 units of auxiliary rolling stock. In 1985-1986, 10.5 million tons of freight (freight turnover of 3094 million ton-km) and 4.9 million passengers were transported.

Latin America

The Railroads of Argentina. The State railroads of Argentina were put into operation in 1956, and they were initially controlled by a board of directors. At the beginning of the 1960's, however, their status repeatedly changed, and today, despite the fact that the state property is retained for the railroads, they are controlled by a private company, even though the general supervision of their activity is entrusted to the Ministry of Public Works. The Argentinian railroads include six lines with a total extent of 34,509 km and track gauges of 1000, 1435 and 1676 mm. In addition, the country operates a section 400 km long with a track gauge of 750 mm.

A negligible length of railroads is electrified: a section 169 km long using 600 and 800 V direct current and 40 km using 25 kV alternating current. Two steam locomotives, 1042 diesel-electric and 130 diesel-hydraulic locomotives are in operation, as well as 8 electric locomotives. They use 212 diesel and 808 electric trains. The fleet of rolling stock numbers 2016 passenger and 40,579 freight cars of various types.

In the mid 1980's the yearly freight turnover was over 9.1 billion ton-km and the passenger turnover was about 11 billion passenger-km.

National Railroads of Venezuela. Despite the fact that as far back as 1950 plans existed for widescale construction of railroads, only two lines have been built. These are the section from Puerto Cabello to Barquisimeto and the line to Acarigua. A study is being made of the possibility of building a section which will connect Caracas, the capital of the country, with the port of La Guaira, and several railroad routes within the country are being built.

The extent of Venezuela's railroad system is 336 km, with track 1435 mm wide. The fleet of rolling stock consists of 17 diesel locomotives, 20 diesel-trains, 18 passenger and 272 freight cars. In 1986, 113,500 tons of freight (freight turnover of 11.5 million ton-km) was transported, and the passenger turnover was 17.1 million passenger-km.

National Railroads of Colombia. The country's first railroad was opened in 1874. Until 1922, all five railroads in Colombia belonged to England, but then they were nationalized. Today the railroads are managed by five regional administrations, united by the centralized government of Bogota.

Colombia's railroads extend for 2611 km, with a track gauge of 914 mm. In 1986, 1.2 million tons of freight was shipped (freight turnover of 694 million ton-km), and 1.5 million passengers were transported (passenger turnover 181 milllion passenger-km). The roads use 153 diesel locomotives and 6 steam locomotives, 16 diesel trains, 164 passenger and 4111 freight cars.

State Railroads of Uruguay. The State railroad system of Uruguay was formed in 1952, when three railroads and groups, encompassing individual regions of the country, were combined. Today the network extends for 2991 km, with a track gauge of 1435 mm. In 1986, 867,000 tons of freight were transported (freight turnover of 203.8 million ton-km) and 3.3 million passengers (passenger turnover of 195.6 million passenger-km). Operating on the network are 79 diesel locomotives and 10 steam engines, 27 diesel-trains, 56 passenger and 2589 freight cars.

Africa

Railroads of Algeria. The first railroad sections in the country were constructed by the Railroad Company of Algeria in 1860-1862. After independence was obtained in 1962, the railroads were nationalized, and beginning in 1976, after reorganization of the transport structure, the company, Railroads of Algeria, under the jurisdiction of the Ministry of Transport, has engaged in the current operation of railroad transport. Construction of new lines was entrusted to the Infrafer enterprise, created in 1987.

Of the 3761 km of lines, 2649 have 1432 mm tracks and 1112 km have 1055 mm tracks. A section 296 km long was electrified, using a 3kV direct current. Transport is implemented by 183 diesel locomotives and 26 electric locomotives, 42 suburban trains, 411 passenger and 12,300 freight cars. There are 3305 cars equipped with bogies for track changes. Over 11.4 million tons of freight (freight turnover exceeds 2.6 billion ton-km) and about 36 million passengers (passenger turnover reaches 1.9 billion passenger-km) are transported yearly.

The Railroad of Angola. The national network, created after the gaining of independence in 1975, combined four formerly independent systems, the oldest of which (in Luanda) had been in existence since 1886. The most important is the Transangola mainline, opened in 1928, which passes along 10° southern latitude and provides an exit for Zaire, Zambia and other South African countries to the Port of Lobito, located on the coast of the Atlantic Ocean. Since 1975 the internal political situation in the country has not permitted carrying out regular transport along this route, but since 1987 it has begun to be reestablished and modernized as a through international route.

The total extent of Angola's railroads is 2952 km, of which 2798 have a track gauge of 1067 mm and 154 km—of 600 mm. The fleet of rolling stock numbers 114 diesel locomotives and 120 steam locomotives, 243 passenger and 4011 freight cars.

Railroads of Benin. The Central Benin Railroad, put into operation in 1900, connected the seaport of Cotonou with the river port of Save. Sections of the East Benin road were constructed in the period from 1907 to 1913, and the railroads went to the interior of the country in 1935. In 1959, by agreement between the governments of Niger and the Republic of Benin, a unified organization was formed, operating the railroads of the neighboring states. In 1978 construction was begun on a route extending 650 km to the north to Niger and its capital Niamey.

State Railroads of Gabon. Construction of the first line from the capital of Libreville to Franceville (near the border with the Congo) was begun in 1974, to provide export freight transport from the Congo. Private operation of the line began as early as 1978, but as a whole the line was opened only in 1986. Today it extends for 523 km, with a track gauge of 1437 mm. Over 100,000 passengers and about 630,000 tons of freight are transported on the line yearly. Ten diesel-electric locomotives, 2 diesel-trains and 15 passenger, 405 freight and 111 auxiliary cars are in operation.

The Railroad Corporation of Ghana. The first line from the Port of Sekondi to the interior of the country was constructed in 1901. Up until 1977, when the Corporation was formed, Ghana's transport system was managed by the railroad and port administration. Today, after three years of construction and renovation work, financed by the World Bank and the African Bank for Development, a network of three independent lines has been created in the country, administrative control of which is implemented from Accra, Kumasi and Takoradi. The total length of the lines is 947 km, and the track gauge is 1067 mm. There are 70 diesel locomotives, 137 passenger and 2324 freight cars in operation. In 1985, 2.1 million passengers (passenger turnover of 201 million passenger-km) and 510,000 tons of freight (freight turnover of 73.6 million ton-km) were transported.

Railroads of Guinea. As early as 1910 a line was opened, linking the ocean port of Conakry with the territories lying at the upper reaches of the Niger River. In 1914 the line was continued from Kouroussa to Kankan. The widespread layout of the railroads indicates their orientation toward export of the country's raw material products (bauxite, alumina, tropical fruits and coffee) through seaports.

The railroad line, 662 km long, has a track gauge of 1 m. The yearly freight turnover is 7.3 million ton-km, and the passenger turnover is 41.5 million passenger-km. The railroads are equipped with 30 diesel locomotives, 16 diesel-trains, 20 passenger and 500 freight cars.

National Railroads of Egypt. The railroad line between Alexandria and Cairo, the construction of which was begun in 1852 (put into operation in 1854), became the first railroad on the African continent. By 1858, the railroads had already linked Alexandria and Cairo with the Port of Suez. At present, Egypt's railroad system is oriented mainly toward transporting passengers to the north and northeast of the country.

Some 551 million passengers (passenger turnover 24, 103 million passenger-km) and up to 8.3 million tons of freight (freight turnover 2597 million ton-km) are transported yearly. There are 575 diesel locomotives, three gas turbine train sets, 21 diesel-trains and 52 half train sections, 2321 passenger and 17,092 freight cars in operation. The total extent of Egypt's railroads is 4321 km, with a track gauge of 1435 mm, and 25 km of suburban tracks are electrified with a direct current of 1.5 kV.

National Railroads of Zaire. The railroad system was created in 1974 through combining five local lines and railroad companies. Individual sections are managed by regional centers, located in Likasi, Kananga, Isiro and Kalemie. The transit road to the south of the country is very important for the economic system. It connects laterally the intra-African raw material regions with the seaports of Angola. Sections in the west of Zaire will be turned over for leasing to the National Transport Bureau in the period from 1981-1991, and mixed freight transport will be carried out along it.

The network, extending 4775 km, is divided into three sections: 3602 km with a track gauge of 1067 mm, of which 858 km are electrified, using a 25 kV alternating current, 125 km with a track gauge of 1000 mm and 1048 km with a track gauge of 600 mm. The network, on the whole, uses 82 mainline diesel locomotives, 62 shunting

diesel locomotives, 54 main line electric locomotives, 35 diesel-trains, 261 passenger and 4911 freight cars. The passenger turnover is 292 million passenger-km and the freight turnover—1955 million ton-km.

Railroads of Zambia. The first railroads appeared in Zambia (at that time Northern Rhodesia) in 1905. The unified railroads of Zambia, created in 1967, included sections of the Rhodesian railroads to the north of the Victoria Falls, and in 1973 a section 164 km long from Livingstone to Mulobezi in the south of the country. The extent of the network is 1266 km, and the track gauge 1067 mm. The transport volumes in 1986 were 307 million passenger-km and 1337 million ton-km. There are 79 diesel locomotives, 89 passenger and 6556 freight cars.

National Railroads of Cameroon. Created in 1905, the Society of Railroads of Cameroon, by 1914, had constructed and put into operation the first lines from the port of Douala to N'kongsamba to the north and to Eseka to the east. In the 1920's, construction continued to the interior of the country, to Yaounde, and by 1974 the line to N'gaoundere encompassed practically all the mineral extracting regions of Cameroon. The total extent of the national network is 1115 km of meter-track. The fleet of rolling stock includes 113 diesel locomotives, 4 diesel-trains, 110 passenger and 1972 freight cars. In 1985-1986, 2 million passengers were transported (passenger volume was 412 million passenger-km) and 1.8 million tons of freight were shipped (freight turnover 871 million ton-km).

Railroads of Kenya. The first railroad line in Kenya, known as the Uganda Railroad, was put into operation in 1901. By 1948, all the lines of Kenya, Uganda and Tanganyika were combined under the management of a unified administration, but in 1977 each of the countries mentioned introduced its own control of the railroads in its territories. Independent functioning of the Kenya railroads began on 20 January 1987.

The network is 2650 km long, the track gauge is 1000 mm, and 239 diesel locomotives, 591 passenger and 6552 freight cars are in operation. The work indicators of the railroads in 1986: 687 million passenger-km and 1827 million ton-km.

Congo-Oceanic Railroad. In accordance with the traditions of development of the economy of the former colonies, the Congo Railroad line provides communication between the interior regions as well as the capital of Brazzaville, with the Port of Pointe Noire, located on the Atlantic coast. The line extends 510 km, with a track gauge of 1067 mm. At the beginning of the 1980's, the network yearly transported 2.4 million passengers and 2.9 million tons of freight, the transport volumes were 380 million passenger-km and 798 million ton-km. Some 42 diesel-electric locomotives, 20 shunting diesel locomotives, 6 diesel-trains, 82 passenger and 1775 freight cars are used.

The Abidjan-Niger Railroad. The railroad, running from Abidjan to the north on the Upper Volta, provides economic ties between the Ivory Coast, Burkina Faso, Mali and Niger with the Bay of Guinea and the sea routes leading from Africa to the industrial centers of the developed countries. The first railroad section on the territory of the Ivory Coast was constructed in 1905. The Abidjan Niger Railroad existed as a unified whole, however, until 1986, when it was divided into two state railroads. In 1985, preceding the division, its extent was 660 km (1000 mm track), and it shipped 2.4 million passengers and transported 667,659 tons of freight, and used 47 diesel-electric locomotives, 39 diesel-trains, and 183 passenger, 1621 freight and 65 auxiliary cars.

Malagasy [Madagascar] Railroads. From the first year of colonial supremacy (1890), the French administration planned the construction of a railroad from the capital, Antananarivo, to the eastern shore of the Indian Ocean. In 1903-1913, the line was put into operation, and by 1923 continued to the interior of the island of Madagascar to the city of Antsirabe. In 1936 a second line, to the south of the island, was also built, which connected the province of Betsileo with the port of Manakara on the shore of the Indian Ocean. Finally, another 19 km of railroad track was built in 1969, especially for the export of chromium ore.

The total extent of the network is 883 km, and the track gauge is 1000 mm. In the mid-1980's, the yearly passenger turnover was 182 million passenger-km (up to 2.2 million passengers were transported), and the freight turnover—235 million ton-km, with 699,000 tons of freight shipped. In operation are 36 diesel locomotives, 28 shunting locomotives, 86 passenger and 1111 freight cars.

The Mali Railroad. Presently representing only part of the former railroads of the Mali Federation, the Mali Railroad links the central districts of the Republic of Mali with Senegal, located to the west of it. The main section of the national railroad between the capital, Bamako and Kayes was put into operation in 1904.

The extent of the railroad is 641 km, with a track gauge of 1000 mm. About 700,000 passengers and 580,000 tons of freight are transported along the line yearly. The passenger turnover reaches 173 million passenger-km, and the freight turnover—251.5 million ton-km. The equipment of the railroad: 21 diesel locomotives, 9 shunting locomotives, 49 passenger and 338 freight cars.

The Railroad Corporation of Nigeria. The status of corporation was obtained by the Nigerian railroads in 1955, although railroad transport has been on record since 1901, when the first section was built from the port of Lagos to Ibadan. At the present time, six semi-autonomous divisions of the Corporation are in operation in the country. The country has adopted a program of railroad transport development, which includes construction of a section from Port Harcourt on the Guinea Basin to Abeokuta, where a new metallurgical complex is

being built, as well as modernization of the track, by adjusting the rails to the standard gauge.

At present, the extent of the country's railroads is 3505 km, with a track gauge of 1065 mm. The freight turnover is 1246 million ton-km yearly, and up to 15.3 million passengers are transported. The rolling stock includes 189 diesel locomotives, 54 shunting diesel locomotives, 480 passenger and 4917 freight cars.

Railroads of Morocco. Since 1963, Moroccan railroads have been combined under the unified administrative management of the Moroccan and East Moroccan Railroads, and since 1976 they have included the formerly independent line, Tangier-Fez. The total extent of the railroad network is 1779 km, of which 794 are electrified using a 3 kV direct current. The track gauge is 1435 mm. Operating in the network are 102 mainline electric locomotives and 151 diesel locomotives, 441 passenger and 10,562 freight cars. Passenger turnover in 1986 was 1958 million passenger-km, and freight turnover—4502 million ton-km.

Railroad Corporation of the Sudan. The railroads of the Sudan were laid in 1875, in connection with the construction of the section from Wadi Halfa, on the border with Egypt, to Khartoum. This line, 927 km long, was constructed in 1900. Today the railroad network of the Sudan consists of five regional directorates with management in the cities of Atbara, Khartoum, Port Sudan (on the shore of the Red Sea), Sennar and Babanusa. The total extent of the lines is 4784 km, and the track gauge is 1067 mm.

In 1985, 837,675 tons of freight and 2.3 million passengers were transported on the network. The railroad equipment: 89 steam locomotives, 242 diesel locomotives and 9 diesel-trains, as well as 480 passenger and 4117 freight cars.

National Railroads of Tunis. Construction of the first line dates back to 1878 and was undertaken by the same company that built the railroads in Algeria. Since 1957, the country's railroad system has been directed by a government organization, and the economic methods of management make it similar to private enterprise. The narrow-gauge network 1000 mm wide in the south of the country was constructed on the basis of the needs of a phosphate-extracting complex, and up until 1966 it was operated by a mining company. In 1967, however, this network was included in the unified national railroad system.

The total extent of the network is 2175 km, with 465 km having a track gauge of 1435 mm and 1689 having a track gauge of 1000 mm. A section 21 km long of narrow track was electrified, using 25 kV alternating current. In 1986 the operating indicators were: freight turnover 1877 million ton-km, passenger turnover 750 million passenger-km. The fleet has 50 diesel locomotives, 21 diesel-trains, 14 passenger and 940 freight cars on the sections with a track gauge of 1435 mm, as well as 148 diesel engines, 24 diesel-trains, 6 electric locomotives, 124 passenger cars and 4378 freight cars on the sections with a track gauge of 1000 mm.

Transport Service of the Republic of South Africa. The first railroad line between Capetown and Wellington was opened in 1863, but as early as 1860 a section 3 km long began to operate to the Port of Durban. In 1910, with the formation of the Union of South Africa, four railroad lines in separate provinces were united under state control, which laid the foundation for creation of a unified UAR transport service. Today the entire network is divided into nine roads and two divisions, controlled by regional administrations.

The total extent of the railroad network is 23,740 km, of which 23,359 km have a track gauge of 1065 mm and 481 km have a track gauge of 610 mm. Some 5738 km are electrified, using 3 kV direct current, and using 50 kV alternating current—861 km, and 25 kV alternating current—1778 km. Some 15 km of the lines are electrified with two voltages. In 1985-1986, 167 million tons of freight were shipped (freight turnover 91,965 million ton-km), and 659 million passengers were transported. Operating on the network are 646 steam locomotives, 2334 mainline electric locomotives and 1599 diesel locomotives, 10,754 passenger, 175,083 freight cars and 114 cranes on a railroad bogie.

Europe

Federal Railroads of Austria. The first steam locomotive connection between Vienna and Bern was opened in 1837. Most of the railroad lines of the former Austrian Empire were controlled by the State, and after its fall in 1924, the railroads were officially nationalized. The Federal Railroads of Austria were formed in the postwar years and have existed as an administrative entity since 1947. It was Austria that was the pioneer for electric haulage: in 1911 the Polten-Gusswerk section was electrified, using a 6.5 kV current.

The total length of the network is 5745 km, of which 5366 km have a track gauge of 1435 mm (including 3026 km electrified with a 15 kV alternating current, and a frequency of 16 ⅔ Hz) and 379 km of narrow-gauge lines with a track gauge of 1000 and 760 mm (including a 91-km section of track using a 6.5 kV alternating current, 25 Hz). In 1986 the Austrian railroads transported 158 million passengers and 55.1 million tons of freight.

Operating on the sections with a standard track gauge are 695 electric locomotives and 465 diesel locomotives, 220 half train sections and 76 diesel-trains, as well as 3355 passenger, 717 postal-baggage and 32,577 freight cars, including 862 with a changeable track gauge. Operating on the narrow-gauge sections are 18 steam locomotives, 15 electric locomotives and 33 diesel locomotives, as well as 161 passenger, 22 postal-baggage and 726 freight cars.

Railroads of Belgium. The National Railroad Company of Belgium was formed in 1926 and took under its control the entire railroad network, which for 75 years

previously had been controlled by the State Railroad Administration. The first line was put into operation in 1835 and connected Brussels and Mechelen.

Of the 3667 km of track, 1978 have been electrified, using a 3 kV direct current. The track gauge is 1435 mm. Operating on the network are 319 mainline electric locomotives and 841 diesel locomotives, 64 diesel-trains and 651 half train sections, as well as 2171 passenger, 5? postal-baggage and 36,301 freight cars. In 1986 the passenger turnover was 6572 million passenger-km and the freight turnover—8254 million ton-km.

National Narrow-Gauge Railroads of Belgium. After discussing, in 1881, ways to develop the narrow-gauge network of railroads in the country, a specially designed commission formed the appropriate society. The first sections of narrow-gauge roads connected Ostend and Nieuwpoort as early as 1885, using steam locomotive haulage, but as early as 1894, for the first time in Belgium, an electric haulage company was introduced. Despite the fact that narrow-gauge railroad traffic has been replaced everywhere by motorbus transport, two networks of these railroads are still in operation within the framework of national communication. Their extent is 170 km, of which 165 km have been electrified, using a 600 V direct current. The track gauge is 1000 mm. The passenger turnover is 92 million passenger-km, and up to 10 million passengers are transported yearly. The network uses 4 locomitives, 11 diesel-trains, 229 half train sections and 51 freight cars.

Bulgarian Railroads. The State controls the country's railroads. The main line, passing through Sofia and Plovdiv, and connecting with Yugoslavia on the west and Turkey on the east, is a part of the transcontinental line from Europe to Asia. Also of substantial importance for the country's economic system are the lines connecting the country with the CEMA member countries. Because of this, the successful operation of the Varna-Ilichevsk (USSR) railroad-ferry through the Black Sea should be noted.

The extent of the railroad lines is 4294 km, with a track gauge of 1435 mm, as well as 245 km of narrow-gauge tracks of 760 mm. Over 2340 km have been electrifed, using a 25 kV alternating current. In the mid-1980's, 185 million tons of freight (freight turnover of 18o,327 million ton-km) were transported, and up to 134 million passengers (passenger turnover 9128 million passenger-km).

The British Railways Board. The board was created on 1 January 1963, having taken on the responsibility of offering railroad-transport services, as well as those combined services formerly offered by the British Transport Commission. The network of railroads is broken down into 5 divisions: Scotland, Southern, Eastern, Western and London Central.

The total extent of the lines controlled by the British Railways is 16,666 km, of which 4280 km have been electrified. Various systems of power supply have been adopted in the network: direct current of 630/750 V (1948 km) and 1.2 kV (16 km), as well as 6.25 kV (23 km) and 25 kV (2293 km) of alternating current. With the exception of a section 19 km long with a track gauge of 600 mm, the track gauge on British railroads is 1435 mm. In 1986-1987, the work indicators were: passenger turnover 30,812 million passenger-km, with 689 million passengers transported, and freight turnover of 16,561 million ton-km, with 138 million tons of freight shipped.

The fleet of British railroads numbers 197 hauling units for express consists, 2201 mainline diesel locomotives and 240 electric locomotives, 712 cars for express consists, 3276 passenger and 33,682 freight cars, 2625 diesel-trains and 7034 half train sections, as well as 3 steam locomotives, 1 diesel locomotive and 17 narrow-gauge track cars.

Northern Ireland Railways. Created in 1967 to provide transport service for Northern Ireland, the company is a daughter company to the Transport Company of Northern Ireland. It serves over 5.5 million passengers yearly; has an extent of 357 km with a track gauge of 1600 mm. There are 8 diesel locomotives, 44 diesel-trains, 32 cars and other rolling stock as company property.

State Railroads of Denmark. The State owns about 80 percent of the country's railroads. The Copenhagen-Roskilde line is the oldest, and was put into operation in 1847. Denmark is situated on islands, which created additional difficulties in developing railroad transport and required the construction of long bridges and ferry crossings. Presently operating in the country are five railroad ferry crossings, and in 1992 it is planned to put into operation a tunnel and a bridge across the Straits of Store Balt, which is 18 km wide. Electrification of the main lines, using 25 V alternating current has begun.

The total extent of the country's State railroads is 2471 km, of which 145 km have been electrified, using 1.5 kV direct current, and 44 km—using 25 kV alternating current. The track gauge is 1435 mm. In 1985 the freight turnover was 1749 million ton-km, and the passenger turnover was 4442 million passenger-km. The fleet of locomotives and cars numbers 197 diesel locomotives and 8 electric locomotives, 221 shunting diesel locomotives, 83 diesel-trains and 282 half train sections, and 895 passenger and 7408 freight cars.

Irish Railways. In 1945 the process of merging the Irish railway companies began. First to be combined were the Great Southern and Dublin United companies, and after them, the Great Northern Railway joined. In 1986, after reorganizing the transport structure in the country, the Unified Railways of Ireland were formed. The extent of this State transport network is 1940 km, of which a section 38 km long is electrified, using 1.5 kV direct current. The track gauge is 1600 mm. The use of 130 diesel locomotives, 40 electric cars, 326 passenger and 1938 freight cars on the network provides passenger transport in a volume of 1075 million passenger-km and freight transport in a volume of 574 million ton-km.

National Railway Society of Spain. The first public railroad in the country appeared in 1848. Until 1936-1939, when the railroads were nationalized, four private companies owned practically all the wide-gauge lines in Spain. As early as 1942, however, because of the creation of the National Society, the railroads went under the control of the State, although nominally this corporation does not depend on the government and is controlled by an Administrative Council.

The extent of the lines is 12,691 km, the track gauge is 1668 mm, as well as 19 km of 1000 mm track gauge. Some 6181 km of wide-gauge railroads have been electrified; a section 29 km long, using 1.5 kV direct current, and 6156 km using 3 kV direct current; using 1.5 kV direct current—a narrow-gauge section. Passenger turnover in 1986 was 15,646 million passenger-km, and freight turnover—11,077 million ton-km. The fleet of rolling stock numbers 625 electric locomotives and 760 diesel locomotives, 498 half train sections and 219 diesel-trains, as well as 1525 passenger and 36,461 freight cars.

State Narrow-Gauge Railways of Spain. The association encompasses six lines in the north of Spain with a total extent of 1148 km, of which 84 km are electrified, as well as three Mediterranean lines of 141 km. All the lines have a track gauge of 1000 mm. The Association operates 96 diesel locomotives, 100 diesel- and 31 electric trains, and also 133 passenger and 2294 freight cars.

State Railroads of Italy. Railroads began operating in Italy as far back as 1839, when a section 7.6 km long was constructed. The merging of three private companies in 1905-1907 led to the formation of a network of State Railroads. Since 1 January 1986, however, the railroad network stopped being a sector of the economic system, controlled by the government, and was converted to an independent corporation, even though belonging to the state, directed by its own administrative Council.

The extent of the network belonging to the Corporation is 16,105 km with a track gauge of 1435 mm, as well as a section 71 km long on Sicily, with a track gauge of 950 mm. Some 8811 km of lines are electrified, using 3 kV direct current, and 287 km using 25 kV alternating current. In 1986 the passenger turnover was estimated as 40,500 million passenger-km, and the freight turnover—as 17,516 million ton-km. The network uses 2050 main-line electric locomotives and 1133 diesel locomotives, 14,820 passenger, 1413 postal-baggage and 104,120 freight cars.

The Railroad of Umbria. A governmental commission of Italy manages the road. The length is 152 km, and the track gauge 1435 mm. The railroad was electrified on 3 kV direct current. The equipment: 4 electric locomotives, 2 diesel locomotives, 13 half train sections, 21 passenger and 66 freight cars.

The Southeastern Railroad of Italy. An Italian Government Commission controls the railroad. Its extent is 475 km and its track gauge 1435 mm. It owns 13 diesel-electric and one diesel-hydraulic locomotive, 5 shunting locomotives, 57 diesel-trains, 47 passenger, 13 baggage and 274 freight cars.

The Northern Milan Railroad. The length is 218 km, of which 200 km are electrified using a 3 kV direct current. The track gauge is 1435 mm. The railroad operates 3 steam locomotives, 7 diesel locomotives and 15 electric locomotives, 68 half train sections, 254 passenger and 227 freight cars.

The Railroads of Calabria and Lugano. An Italian Governmental Commission controls the railroad network. The extent is 418 km, the track gauge is 950 mm. It owns 12 diesel locomotives, 56 diesel-trains and 100 freight cars.

The Railroad Around Vesuvius. An Italian Governmental Commission controls the railroad. It is 146 km long, the track gauge is 950 mm and the energy supply system is 1.5 kV of direct current. It owns 85 three-car sections, 2 diesel locomotives and 18 passenger cars.

The Brescia-Iseo-Edolo Railway. The line is 108 km long and is located in the north of Italy. The track gauge is 1435 mm. Transport is implemented by 12 diesel locomotives, 10 diesel-trains; the rolling stock numbers 14 passenger and 63 freight cars.

The National Railroads of Luxemburg. The Administrative Council of Luxemburg Railroads has 21 members, but only 13 of them are citizens of Luxemburg: 5 members are appointed by the Belgian government and 3—by the French government.

The extent of the country's railroads is 270 km, of which 162 km are electrified (143 km using 25 kV alternating current, and 19 km—using 3 kV direct current). The freight turnover in 1986 was 604 million ton-km, and the passenger turnover was 278 million passenger-km. Used for transport are 51 diesel locomotives, 18 electric locomotives, 8 half train sections, 8 diesel-trains, 75 passenger and 2734 freight cars.

Railroads of the Netherlands. The company was formed in 1938 as the result of the merging of a number of national railroads. The State is only a shareholder in the company and bears the expenditures to compensate for losses in service to the public sector, as well as implementing the investment to develop the railroad infrastructure and construction of new lines and stations.

The extent of the lines is 2817 km and the track gauge is 1435 mm. Some 1841 km of lines are electrified, using 1.5 kV direct current. In 1986 the passenger turnover was 8919 passenger-km, 210 million passengers and 19.1 million tons of freight were transported (freight turnover 3107 million ton-km). The network operates 150 main-line electric locomotives and 292 diesel locomotives, 127 shunting locomotives, 1401 electric- and 285 diesel-trains, and 501 passenger and 10,382 freight cars.

State Railroads of Norway. The first private railroad line in the country—Oslo-Eidsvoll—was put into operation in 1854. Soon afterwards the railroads became the property of the State. In 1911, electrification of the Norwegian railroads began. In 1962, the construction of railroad sections in the north of the country was completed, and since then no railroads have been built in Norway.

The extent of the network is 4242 km and the track gauge 1435 mm. Some 2443 km are electrified (15 kV alternating current, frequency 16 2/3 Hz). In 1986, 34.8 million passengers (2233 million passenger-km) and 25.5 million tons of freight (2944 million ton-km) were transported. Norway's railroad property is 16 electric locomotives, 95 diesel locomotives, 47 diesel- and 144 electric-trains, and 782 passenger and 6936 freight cars.

Polish Railroads. The first railroads on Polish territory appeared in 1842. At present the extent of the country's railroads is 25,541 km with a track gauge of 1435 mm and 656 km with a track gauge of 1524 mm. In addition, the country has 651 km of narrow gauge sections and 9542 km of electrified track.

In 1986 the freight turnover was 121,775 million ton-km, and the passenger turnover was 53,808 million passenger-km. At that time the fleet had 2583 diesel locomotives, 1744 electric locomotives and 851 steam locomotives, 988 half train sections and 1912 trailers, 5967 passenger and 171,928 freight cars.

Railroads of Portugal. Until 1926, half (in extent) of the railroads belonged to the State, and the other half—to private companies. Then the state leased its lines to private owners. When the major railroad companies were combined in 1947, the public Portuguese Railroad Company was created. In 1975 it was nationalized, and then in 1977 was expanded through adding several more lines.

The total extent of the network is 3588 km, and of them 2830 km have a track gauge of 1668 mm and 758 km have a track gauge of 1000 mm. Some 434 km are electrified, using 25 kV alternating current, and 26 km using 1.5 kV direct current. In 1986 the freight turnover was 1448 million ton-km, and the passenger turnover was 5779 million passenger-km. The fleet has 176 diesel locomotives and 44 electric locomotives, 111 half train sections and 35 diesel-trains, 508 passenger, 123 baggage and 4933 freight cars.

State Railroads of Romania. The first private railroad in Romania appeared in 1869. In 1888, all the railroads were converted to government property. Today they extend for 11,121 km, including 10,515 km with a track gauge of 1435 mm. There are sections with a track gauge of 762 and 610 mm. Some 3328 km of line are electrified, using 25 kV alternating current. In the mid-1980's the passenger turnover was over 31.1 billion passenger-km, and the freight turnover—over 64.3 billion ton-km yearly.

State Railroads of Hungary. The first steam railroad line, 35 km long, was constructed in 1846. As far back as 1827, however, tracks were laid and a branch 11 km long was put into operation, on which horse-drawing was used in accordance with the Palmer system. The State had already entered into ownership of the railroads in 1868. At present the extent of the State Railroads of Hungary is 7879 km, and of them 7406 have a track gauge of 1435 mm. Sections with track gauges of 760 mm and 1524 mm are encountered. A section 2191 km long is electrified, using 25 kV alternating current. In 1986, 119 million tons of freight and 335 million passengers were transported. The freight turnover was 22,600 million ton-km, and the passenger turnover—12,153 passenger-km. In operation are 463 electric locomotives and 1223 diesel locomotives, 261 diesel-trains and a considerable number of passenger anf freight cars of different types.

The Greek Railroad Organization. Attaching the Peloponnesian railroads and independent railroad companies in the north of Greece to the Greek State Railroads made it possible to implement unified state control over the railroad network of the entire country. In 1971 the Organization of Greek Railroads was created, which is state property. The extent of the tracks belonging to it is 2749 km, including 1565 km with a track gauge of 1435 km, 892 km with a track gauge of 1000 mm and 22 km with a track gauge of 750 mm.

In 1986, 4.2 million tons of freight (702 million ton-km) and 11.7 million passengers (1905 million passenger-km) were transported. The railroads have 171 diesel locomotives, 52 diesel-trains, 324 passenger, 136 baggage and 8901 freight cars.

Soviet Railroads. The first steam powered railroad appeared in 1834 at Nizhniy Tagil in the Urals, where the father and son Cherepanov used a steam engine to transport ore along track rails. In 1837, regular traffic began along the Tsarskoselskoye Railroad near Petersburg. Today USSR railroad transport is the major transport system in the world. With an extent constituting 11 percent of the world railroad network, our country carries out over 53 percent of the freight turnover and about 25 percent of the passenger turnover of all the world railroads. At present railroad transport remains the basic national transport unit, ensuring the development of economic relations, cooperation and specialization of production characteristic for the economic system of the country at the present stage. The railroads have over two-thirds of the internal freight turnover and about 40 percent of the passenger transport.

The first electrified section, 20 km long, appeared in the vicinity of Baku in 1926. In subsequent years, near Moscow, on the Transcaucasus and Donetsk roads, a direct current system with a voltage of 1.5 and 3 kV was introduced, as well as an alternating current system with a voltage of 25 kV. In the 1980's alone, 16,100 km of track was electrified, and at the beginning of 1989, the extent of electrified lines was 52,900 km. Due to the high

electrification rates, the relative proportion of freight work fulfilled by electric haulage in the total freight turnover volume was, in 1988, 63 percent as compared with 54.9 percent in 1980.

The operating length of the USSR railroad network is 146,600 km (in 1980—141,800 km) and the length of double-track lines is 53,200 km (in 1980—47,100 km). In 1988 the freight turnover was 3924.8 billion ton-km, with 4097.3 million tons of freight shipped (in 1980—3439.9 billion ton-km and 3711.5 million tons respectively), and the passenger turnover was 413.8 billion passenger-km as against 342.2 billion passenger-km in 1980.

The USSR railroad network operates powerful VL80T and VL10 mainline electric locomotives, and is introducing the new 12-axle VL85 locomotive. Sections with diesel locomotive haulage use powerful locomotives with power units of 4000-6000 h.p. New transport technology makes it possible to introduce heavy freight traffic and express traffic for passenger trains. Testimony to the improved use of locomotives in 1988 was the 0.8 percent reduction in its fleet while improving the operating indicators. The car fleet has grown by 0.3 percent as compared with 1987.

The USSR railroad network has 32 economically independent railroads and 170 divisions. The combination of centralized management of the entire network and economic independence of the roads and their divisions at the sites permits railroad transport to better satisfy the needs of individual regions and countries as a whole for freight and passenger transport.

State Railroads of Finland. In 1862 the first line, from Helsinki to Hameenlinna, was put into operation. Historically the track gauge is 1524 mm, and therefore the border station of Tornio was equipped for changing the bogies of the rolling stock, and a double track with gauges of 1524 and 1435 mm was laid on the Tornio-Haparanda (Sweden) section. A railroad ferry has been in operation since 1975 between Finland and Sweden. The country is actively developing mixed motor vehicle-railroad transport according to the Transpoint system (in 1987 over 2 million tons of freight was accepted and shipped).

The extent of the network is 5,863 km, of which 1445 km have been electrified, using a 25 kV altenating current. There are 382 diesel locomotives and 110 electric locomotives, 100 half train sections, 8 diesel-motor cars, 110 shunting diesel engines, 902 passenger and 16,844 freight cars in operation. In 1987, 41.4 million passengers (passenger turnover of 3106 million passenger-km) and 29.99 million tons of freight (freight turnover of 7402 million ton-km) were transported.

National Railroads of France. The National Railroads of France were formed as a unified organizational structure in 1937. In 1983 it became a public industrial-commercial organization, controlled in accordance with the French Transport Law by the Council of National Railroads of France. It consists of 18 members, 7 of which represent State organs, 6 of which are selected by railroad personnel and 2 of whom are users, i.e., organizations of the public or freight owners. Structurally, the network of the National Railroads of France is divided into 4 regions—the Northeastern, Western, Southwestern and Southeastern, which in turn are divided into 25 divisions.

The total extent of the railroad network is 34,665 km, with a track gauge of 1435 mm. Of the 11,549 km of electrified lines, 5742 have been electrified, using 25 kV alternating current, 5726 km—using 1.5 kV direct current, 10 km—using 750 V direct current, 12 km—using 15 kV alternating current with a frequency of 16 ⅔ Hz. In 1986 the passenger turnover was 59,700 million passenger-km, and the freight turnover was 51,700 million ton-km, and 774 million passengers and 146 million tons of freight were transported. The network has 2313 electric locomotives and 1977 diesel locomotives, 109 TGV high-speed trains, 728 diesel-trains and 745 half train sections, as well as 10,100 passenger, 671 baggage and 192,000 freight cars.

Federal Railroads of the FRG. The first line, from Nurenberg to Furth, was put into operation on German territory in 1835. The system of the Federal Railroads was formed in 1945 and reorganized in 1951. A Council of Governors with 20 members and a Directorate with 8 members control the railroad network. The Federal Railroads have economic and financial independence in the FRG economy. Control is constructed on the regional principle with centers in Essen, Frankfurt-am-Main, Hamburg, Hannover, Karlsruhe, Cologne, Munich, Nuremberg, Saarbruchen, Stuttgart and West Berlin.

The extent of the FRG railroads is 27,484 km, and the track gauge is 1435 mm. Some 433 km of lines have been electrified, using 15 kV alternating current at a frequency of 16 ⅔ Hz. In 1986 the passenger turnover of the FRG railroads was 52,446 million passenger-km and the freight turnover—65,131 million ton-km. The railroad has 2595 diesel locomotives and 2880 electric locomotives, 225 diesel- and 1591 electric trains. The rolling stock fleet numbers 13,119 passenger and 247,948 freight cars, and in addition, there are another 50,122 freight cars and flatcars.

State Railroads of Czechoslovakia. In 1825, what was then Austria began operation of the line from Ceske Budejovice-Linz. The country's railroads were noticeably developed after the second world war: work was begun on rebuilding and electrifying existing lines and constructing new ones. The entire network was divided into four administrative zones from the centers to Prague, Pilsen, Olomouc and Bratislava. The total extent of the lines is 13,611 km, including 12,870 with a track gauge of 1435 mm, 100 km with a track gauge of 1520 mm and 146 km of narrow gauge. Some 3530 km are electrified, of which 1318 km use 25 kV alternating current and 2107 km use 3 kV direct current. In 1986 the

freight turnover was 69,401 million ton-km, and the passenger turnover was 19,935 million passenger-km. The Czechoslovakian railroads are equipped with 1341 electric locomotives and 3303 diesel locomotives, 1160 diesel-trains and 122 half train sections.

Federal Railroads of Switzerland. The first line was put into operation in 1847, and the first electrified line was opened in 1904. The start of nationalization was laid in 1902, but to this day the country has two important and several small lines, which are the property of individuals or companies. Being the property of the Swiss Confederation, the Federal Railroads are organizationally independent of the government, and are directed by an Administrative Council. The extent of the railroad network is 2895 km, the track gauge is 1435 mm, 2879 km are electrified, using a 15 kV alternating current with a frequency of 16 ⅔ Hz. The network has an electrified section with a track gauge of 1000 mm, and a length of 74 km.

In 1986 the Swiss railroads transported 228.5 million passengers (9325 million passenger-km) and 45.1 million tons of freight (6966 million ton-km). Operating on the network are 881 electric locomotives, 176 half train sections, 109 diesel locomotives and diesel-trains, and 3369 passenger, 379 baggage and 31,005 freight cars.

The Bern-Loetschberg-Simplon Railroad (Switzerland). Built in the period from 1906-1913, the road had the purpose of ensuring a direct route to Italy through the Simplon Tunnel. The extent of the line is 115 km, and the track gauge 1435 mm. The road was electrified, using a 15 kV alternating current with a frequency of 16 ⅔ Hz. In 1985 the passenger flow on the line was 203 million passenger-km, and the freight turnover—231 million ton-km. The line is served by 46 electric locomotives and 10 half train sections, 132 passenger and 306 freight cars, as well as a number of auxiliary self-powered mechanisms.

The Brig-Visp-Zermatt Railroad (Switzerland). Its extent is 44 km, and the track gauge is 1000 mm. It is electrified with an 11.5 kV alternating current with a frequency of 16 ⅔ Hz. It is equipped with 6 electric locomotives, 1 steam locomotive and 2 diesel locomotives, 49 passenger, 4 baggage and 80 freight cars and a number of auxiliary self-powered mechanisms.

State Railroads of Sweden. They encompass all the main railroad routes of the country, as well as a large number of secondary lines, although there are several privately owned ones among the latter. Electrification work was first begun in 1894. At present, out of 11,139 km of general extent, 6995 km of lines have been electrified with a 15 kV alternating current. The track gauge is 1435 mm, but there is a section 97 km long with a track gauge of 891 mm.

In 1986 the Swedish railroads transported 73.5 million passengers (6300 million passenger-km) and 53.3 million tons of freight (17,757 million ton-km). There are 694 electric locomotives, 540 diesel locomotives, 171 half train sections, 124 diesel-trains and 1686 passenger and 37,259 freight cars in operation.

Railroads of Yugoslavia. The first line on Yugoslavian territory was opened for traffic in 1849, and connected Maribor with Ljubljana. Today the Yugoslavian railroads, with an extent of 9393 km and a track gauge of 1435 mm, encompass the entire country and are divided into eight regional divisions with semi-autonomous rights in their territorial zones. Some 3320 km of railroad have been electrified with a 25 kV alternating current and 3 kV direct current.

In 1986 the railroads transported 89.8 million tons of freight (27,000 million ton-km) and 131 million passengers (12,400 million passenger-km). The fleet of rolling stock has 259 steam locomotives, 428 electric locomotives and 757 diesel locomotives, 323 diesel- and 86 electric trains, as well as 2146 passenger and 47,515 freight cars

International Transport Organizations

IRCA includes a number of organizations uniting the railroads of one or several countries, regions and also some continents. These are the Panamerican Railroad Congress Association (PARCO), combining the railroad associations and organizations of 21 countries on the American continent, the Latin American Railroad Association (ALAF), which includes the representatives of 17 countries in Latin America, the Association of American Railroads (AAR), the International Sleeping Car Company (TsIVLT), operating in Europe and Egypt, the Company of Sleeping and Special Cars of the FRG Railroads, the National Federation of Transport Enterprises of Italy, Interkonteiner, representing 23 railroads of Europe and contributing to the growth of container freight transport, Interferry, contributing to the development and technical equipment of ferrying, Interfrigo, contributing to the development of international transport of perishable freight and combining 25 railroad administrations of countries on the European continent, the International Rail Transport Committee (MKZhT), contributing to the development of international law in the sphere of railroad transport and combining the administrations of 31 countries in Asia, Africa and Europe, the TransCameroon Railroad Administration, the French Bureau of Cooperation in the Sphere of Railroad Transport and Equipment, OFERMAT, the Society of Belgian English Railway Ferries, the International Union of Railways (IUR), which has the goal of improving conditions of railroad construction and functioning and combines 62 administrations from 58 countries and territories of the world, and a number of other organizations.

The International Union of Railways Today

18290186d Moscow ZHELEZNODOROZHNYY TRANSPORT in Russian No 4, Apr 89 pp 18-21

[Article by G. Bule, general secretary of the IUR [International Union of Railways]: "The International Union of Railways Today"]

[Text] The International Union of Railways exists because boundaries exist. Political, economic, technical

or cultural boundaries hold back the development of railroad service in both international trade and tourism. On the European continent they give rise to a number of specific problems, beginning with currency problems and ending with the track gauge and the electrification system. At the same time, a number of "boundary area" problems exist, common to Europe, Asia, Africa and America. These problems are not new, but there are substantial changes. First of all is the increase in potential for international transport, which is directly related to the development of world trade. Under these conditions, the IUR makes its contribution, in many ways unique, to the process of transport control, regardless of boundaries.

Another factor determining the role of the railroads in the world today is the progress in the sphere of technology. It has made it possible for railroads to play a more noticeable role in long-distance transport. Mixed motor vehicle-railroad transport of freight and express passenger traffic is being increasingly developed on the international plane.

Finally, we are witnesses to an information revolution. Information systems are increasingly used in the operation of transport systems, providing them with a high-quality control mechanism and instrument to serve the clientele. The combination of information systems to satisfy the demands of transporters and freight owners has required particular coordination of railroad activity. On the other hand, the range of isolated, individual information systems today have become increasingly limited.

The International Union of Railways was originally created as an institute in the sphere of standards, called upon to solve relatively narrow "boundary area" problems, which arose in Europe after World War I. Since then the range of its activity has considerably expanded—both functionally and geographically. With the development of international collaboration, there has also been a steady increase in the sphere of activity of the IUR, in the interests of large and small railroads throughout the world.

International Transport Control

Two clearly marked trends exist in the development of the international division of labor. The complexity of the problems requires a multi-planar approach. The transition to new spheres of activity has technical, commercial, legal and financial aspects. At the same time, the need often arises to integrate formerly autonomous structural units. The absorption in 1982 by the International Union of Railways of the RIV and RITs car associations, and in 1986—of the European Conference on Passenger Rates (EPC), signified a striving to improve the quality of the decisions and planning adopted. The agreements reached with interested organizations on the traffic schedule reflect an analogous desire to achieve agreement in strategy and tactics. The adoption of the project of an "electronic bill of lading" by DOTsIMEL demonstrates the level of coordination of actions between the IUR and the International Rail Transport Committee (MKZhT).

At the same time, a reverse tendency exists—the creation of groupings of railroads within the IUR. The point is that not all the railroads are ready immediately to participate in new organizational schemes. Their economic priorities are different, and they are differentiated by their degree of technical readiness. The way out here is for us to designate this by the term "changeable geography." It is a question of a certain geographically related group of railroads being able to come forward in the matter of creating a joint enterprise without drawing into it the Union as a whole. The individually controlled means and resources allotted to certain specific projects make it possible to begin work quickly. Without this process, there would be substantial delay because of the need to achieve the preliminary unanimity of all the Union members. At a later stage, other railroads can join in to the project.

This is what happened, for example, with the Hermes project, which specified an automated information exchange. Initially it was put into action by six railroads, today it has spread to nine, and by the middle of the next decade it will possibly encompass a number of other roads in Eastern and Western Europe.

Most of the programs of the IUR meet the requirements of the European railroads. At the same time, the Union plays a universal role, and at present has 35 non-European railroads as its members. Since 1983 the Union has included organizations representing railroads of Australia and the United States. The IUR has established close ties with regional associations of Africa (SAZhD), Asia (ATGZhD) and Latin America (ALAF, PARCA).

In 1988 the IUR structure was updated in order to ensure international collaboration of the railroads in the information sphere. At the same time, a program was developed to direct personnel training and the process of transmitting technology in this sphere.

Development of the European Network

In 1971 the IUR began actively to embody the Master Plan for Development of the European Infrastructure. This undertaking was the first attempt of this type and included establishing the technical parameters for the future infrastructure. The plan became the basis for the intergovernmental All-European Agreement on the Network of Mainline Railroads, approved by the European Economic Commission of the United Nations Organization (ECE UNO) and ratified by the member countries. The main importance of this instrument of strategic planning lies in the fact that it will help to determine priorities in investment activity and ensure the compatibility of individual national projects. For example, the basic technical parameters to construct new lines, including express ones, are determined on the basis of the All-European Agreement.

The master plan is being constantly developed and improved. One of the directions of this development was the creation of a unified project, consolidating the future network of express lines in Europe. A detailed study of the routes was made by groups of railroads in accordance with a definite program. Specifically, in 1988 an survey was made of the complete route from North to South, connecting Holland and Italy. At the same time, the potentials for modernization in the investment sphere were also determined. Work on making the shunting stations more efficient was also completed.

Improving Standards

From the very start of IUR activity, its attention was centered on the problem of harmonious development of the rolling stock. The Bureau on Experiments and Research has a permanent program of standardization, which encompasses not only the rolling stock as such, but also its components: drive, bogies, materials, etc. At present studies are being made of electric locomotives operating on several current systems. Apparently the next IUR sphere of activity will be signalization and communications to ensure the compatibility of the equipment installed on the locomotives, field apparatus and satellite radio-communication systems.

The IUR was the initiator of introducing new maximum axle loads and speeds on the European standard track gauge network. In the period from 1982-1988 the permissible axle load was increased to 22.5 tons as against the 20 tons adopted as far back as 1936. At the same time, the normative speed of freight trains was increased to 90 km/hr, and on some roads—up to 100 km/hr. Most of the scientific research which made it possible to change these norms was carried out in Vienna on units belonging to the IUR, as well as in Velimo on the CSSR polygon.

The appearance of large freight containers gave a new impetus to the work done by the IUR on the kinematics of track and the development of rolling stock. Reequipment of the European railroads, to operate a new generation of ISO international standard containers on them, also entails the development of the Transsiberian Container Service (TSKS).

In the sphere of passenger transport, high-speed technology has already reached the stage where efforts in this sphere must be coordinated in practice. This is the development of international routes and the appearance of international consortiums of production workers, as well as the realization of the concept of high-speed night trains. The Bureau for Experiments and Research is already participating in the study of problems of aerodynamics, particularly in tunnels, problems of braking in a speed range of from 0 to 300 km/hr, and various aspects of safety in movement. One of the recent studies should assist in increasing the section speed on sections with curves of standard radii.

Potentials for Business Activity

Expanding the demand for travel has had a beneficial effect on intensifying the collective management of international services under the aegis of the IUR. In 1987, the Euro-City flag train system was put into operation, offering travel between 13 countries in two classes of cars. It was recently extended to Hungary. Testimony to the success of Euro-City was the 20-percent increase in its clientele in just the first year of operation.

The principle of assigning parameters for development "from above" will be adopted soonest in the strategy of international night passenger transport. For several years now "sleeping and reserved seat" transport has been going through a depression, and the appropriate rolling stock is getting old. Because of this, in 1988 the passenger commission of the IUR adopted a resolution to develop three interrelated services offered by the railroads, namely: individual sleeping compartments, two-story cars and rolling stock with reclining chairs.

The second element of rejuvenating the international market in passenger transport was the new price policy. Its foundation was laid in 1986 with the introduction of the European passenger rate. Introducing reduced prices for tickets for senior citizens, during family holidays, etc., contributed to attracting additional passengers to the railroads.

In order to improve the quality of international freight transport, the IUR worked out and introduced a program of creating transport traffic based on the possibilities of increasing the speed and reducing the idle times at the borders. Realization of this program was based on close collaboration between individual groups, complying with the marketing, operating and technical policy within the IUR, as well as with the ties with the European Conference on Freight Train Schedules.

The experience of operating direct routes and route trains, the organizational technology of which was worked out for certain markets and directions, plays quite an important role in satisfying the demands for higher quality freight transport. One example of this is the route transport of perishable products between Italy and Northern Europe (TRES line). In order to accelerate the throughput of trains across the borders, the IUR introduced a system for supervising the car fleet and simplified the procedure for inspecting the cars.

Combined motor vehicle-railroad freight transport is the type of technology which makes it possible to increase the share of the railroads in the transport process and reduce the time losses for the intermediate reassembling of the consists and transshipping. Interkonteiner, an IUR company, proved to be quite an effective instrument for switching maritime freight flows to railroads. It offers undoubted advantages to transport freight from seaports to intercontinental addresses throughout Europe, as well as across the "overland bridge" passing through the territory of the USSR to the Far East.

The sphere of combined freight transport is mainly the intercontinental distribution of freight, where its railroad transport growth rates are reaching 10 percent a

year. The use of various mixed bodies on basic freight truck-trailers brought to the foreground the problem of ensuring compatibility. Because of this, to produce a unified railroad approach to standards and to the development of rolling stock, as well as to organize the routing, a new Interunit coordination group was formed in 1985. The IUR also created a number of production associations—groups of railroads which study the market, tariff and operational aspects of a certain specific freight flow.

Information Systems

Railroads have been among the first to use an information processing system, which offers great potentials for improving control of the transport process. At the same time, the accelerated introduction of computer equipment in spheres such as managing resources, monitoring the movement of trains and reserving seats has created a number of problems for international relations. Independent automated information systems have been introduced not only by the railroads, but also by other organizations, in particular, customs authorities.

In 1979 the IUR created an Information Science Commission. An important goal of the Commission was to provide the maximum compatibility of information systems through introducing unified codification. Also posed was the task of improving the network of automated exchange of information and data transfer, known as "Hermes," in order to interconnect the national computerized railroad systems.

Hermes is a unified information system, in which there is an exchange of information on the transport process, as well as commercial, accounting and statistical information. The system, put into operation in 1986, at first encompassed six railroads in countries of Western Europe. The urgent need to improve the quality of international transport in the last two years was an incitement to further distribution of the Hermes system and prompted other railroads to join into it.

The initial use of the information systems was related to freight transport—for efficient tracking and transmission of information. Planning international service for trains and the corresponding operation of shunting stations requires an extensive volume of preliminary information on the freight flows. Organizing information on dispatching cars and on their crossing borders has already proved to be a help in solving this problem.

Today the IUR is looking at the possibility of obtaining a package of data on freight flow. A so-called System of Transport Production Planning is being created. Most of the national railroads have corresponding means of online tracking. Their systems are not, however, adapted for monitoring international freight flows. The Transinfo Unified Tracking Bureau was formed in Basle in 1983 in order to provide eight railroads with current information on traffic. The bureau is in a position to track 800 routes a week, using for this purpose national computer terminal devices. Creating the above-mentioned system provides a basis for integrated planning of the operations process on an actual time scale, for the information of freight owners and control of the car fleet.

In 1987, further development of the basic project was obtained. The project was intended to put into practice international freight bills of lading, filled out in accordance with the International Convention on Freight Transport (TsIM), in an automated information system. This project—DOTsIMEL—is important for bringing efficiency to international freight transport, ensuring its tracking. When the project is completed, the 14 railroads participating in it will be able to be rid of the task of filling out a half million papers a day. It will also be of substantial help in information exchange with other types of transport and foreign administrative organs. The first section of the DOTsIMEL project is planned for realization in 1990.

The Hermes automated data transmission system can also be used for passenger traffic. For example, in 1988, the Hermes transmitted the reservations for seats and sleeping spaces, which yielded a definite effect. The potentials of the system are considerably broader, however. It is a question of a complete set of information for the clientele, including schedule, rates, reserved places and additional services. The air companies have already started to develop a "global ticket distribution system." The IUR considers it necessary to have a general information base for railroads as well. The project developed has the goal of singling out basic information related to railroad tourism, which will be transmitted through the communications system among the railroads, and will also go to tourist agencies and air companies.

The problem of compatibility is inherent in all operations carried out in the sphere of automated information distribution. Therefore the associated work groups of the IUR and the OSZhD [Railroad Cooperation Organization] ensure the compatibility of coding systems on a Europe-wide scale. The development of automated systems will possibly permit problems of the difference in commercial bills of lading for the TsIM/SMGS [digital integrating computer of the Agreement on International Railroad Freight Traffic] to be solved successfully as well.

The IUR represents the railroad members of the Union in intergovernment organs and international associations engaged in coding and standardization. The decision of the customs organs to adopt a regulated system of commodity coding forced the IUR to correct the DOTsIMEL project accordingly. The IUR also published a code of railroad terminology in six languages and is publishing specialized reference books, the latter containing terminology in the sphere of data processing for railroad transport.

Personnel Training

Success in the development of international exchange of goods and services in many ways depends upon the ability of the managers to work in close partnership with their colleagues at other railroads. The IUR personnel

training program plays an important role in supporting this process. As a supplement to the yearly courses in international cooperation, the program at present specifies multi-discipline group projects for young managers (Inter-Management) and exchange of personnel among the railroads of Europe.

The mutual exchange of "know-how" and ideas in the management sphere is an integral part of the goals and tasks of the IUR. In work organization, in problems of increased productivity and in the processes of adapting to the new conditions, different railroads often encounter similar problems. Holding seminars and selecting the appropriate documentation are thus a specific contribution to this matter which can be introduced by the IUR.

"Controlling Changes"—this was the central theme at the conference held in 1987. Beginning in 1989, the IUR intends to hold a series of management seminars, oriented mainly toward the needs of non-European railroads. A series of colloquiums is being organized for directors of technical services on important divisions of technical development such as signal systems, the technology of high-speed traffic and environmental protection.

The Railroad Cooperation Organization: Results and Tasks

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[Article by R. Stavrovski, chairman of the OSZhD Committee]

[Text] In June 1956 the ministries of socialist countries managingrailroads, at a conference in Sofia, resolved to create the Railroad Cooperation Organization (OSZhD). The OSZhD Committee began work on 1 September 1957 in Warsaw, becoming an executive organ of the Conference of Ministers. In 1958 the sphere of activity of the OSZhD also included problems of motor vehicle transport and highways.

The OSZhD is an intergovernment organization, which includes ministries managing railroads in the NRB [People's Republic of Bulgaria], VNR [Hungarian People's Republic], SRV [Socialist Republic of Vietnam], GDR, PRC, KNDR [People's Democratic Republic of Korea], Republic of Cuba, MNR [Mongolian People's Republic], PNR [Polish People's Republic], SRR [Socialist Republic of Romania], USSR and the CSSR. The ministry of Transport of the People's Republic of Albania is also a member of the OSZhD, but it has not taken part in the work of the organization since 1977.

During the 33 years of creative work of the OSZhD, uniting the efforts of its members, it has actively contributed to ensuring the dynamic development of railroad and motor vehicle transport and highways, in accordance with the needs for transport of the national economy and the people. A great deal has been done to create an organization, common to all members, of technical-technological, economic, operational and legal bases for the cooperation of railroads and motor vehicle transport. The scientific-technical collaboration contributes to a considerable extent to the development of transport in each of the OSZhD member countries.

At present, the transport systems of the OSZhD member countries have a powerful material-technical base at their disposal. Their railroads are coping with over two-thirds of the world freight turnover and half of the passenger flow. At the same time, the total operational length of their railroad networks constitutes only 20 percent of the world length. During the period of the organization's existence, its members have increased by a factor of 2.5, and the passenger turnover has almost doubled. The transport volume of export, import and transit freight has grown considerably, and the passenger transport in international traffic has increased. These results not only attest to the intensive use of the technical base of the railroads of the OSZhD member countries, but also to a certain extent reflect the great effectiveness of their collaboration within the framework of the organization.

In the past 33 years the OSZhD Committee and its working organs, in close interaction with the transport ministries of the OSZhD member countries, have fulfilled a number of tasks of great importance for transport. We will name the main ones.

1. Carrying out agreements on international passenger and freight traffic (SMPS [Agreement on International Railroad Passenger Traffic]-SMGS [Agreement on International Railroad Freight Traffic], and the rules and service instructions relating to them. Issuing rates for international railroad traffic, working out the most efficient routes, coordinating transport plans, improving work and developing border railroad stations. Included here is coordination of problems related to constructing and rebuilding railroad lines and highways of international importance.

2. Solving problems of the most economical use of rolling stock, increasing speeds and improving the compilation of schedules for trains in international traffic.

3. Organizing scientific-technical collaboration and exchange of experience in the sphere of railroad and motor vehicle transport, as well as highways, including coordination of the activity of scientific-research institutes and planning-design bureaus.

4. Studying and coordinating problems related to standardizing sizes, rolling stock, the upper structure of tracks, STsB [signalization, centralization and block system] devices, signals and operating rules. Carrying out work on introducing advanced types of traction.

5. Working out problems related to the development and operation of motor vehicle transport and highways.

6. Collaborating with other international organizations on problems of railroad and motor vehicle transport, as well as highways.

The OSZhD has considerable influence on the country's uninterrupted fulfillment of foreign trade freight transport. Each year, in January and February, a conference is held, at which the railroads of the OSZhD member countries, combined into groups, in conjunction with other types of transport and representatives of foreign trade organizations, coordinate the yearly volumes of export-import and transit transport by types of freight and border crossings. The results of fulfilling the outlined volume of foreign trade freight transport in the preceding period are also summed up. At the same time, the shortcomings are analyzed and measures to eliminate them are outlined. These conferences are a good theoretical foundation for support of foreign trade freight transport.

The OSZhD also has the opportunity to contribute to a rise in the transport quality through working out and improving the appropriate rules. These rules regulate practically all the problems pertaining to international freight and passenger transport. A change in the work conditions requires constant, precise defining of the transport rules. That is why for several years the OSZhD Committee has been engaged in revising the text of the SMGS, all the proposals relating to it, and the Service Instructions for the SMGS as well. This great work was completed in 1988. Particular attention is paid to the rules for transport of hazardous freight, in consideration of the recommendations of the United Nations.

In the long-range plan for the work of the OSZhD Committee for 1986-1990, adopted in 1986 at the 14th Session of the Conference of Ministers in Sofia, priority developments and the most important tasks in the sphere of developing the transport of the organization's member countries were determined for the first time. These tasks include, particularly: increasing the average weight of a freight train; raising the axle load of freight cars to 22.5 tons and over; improving the work of the border stations; creating a network to transmit data on transport operations; improving the organization of international passenger transport; developing mixed freight transport; reducing manual labor in routine repair of the track; improving the management, organization, planning and accounting of motor vehicle transport and highways; improving the design, construction and maintenance of motor vehicle bridges.

This program is being successfully put into practice. For example, within the framework of the task of improving the work of the border stations, an analysis is being made of the idle times of freight cars and trains at these stations. Proposals for reducing them are being worked out on this basis. Technical and organizational proposals are being prepared to ensure more effective monitoring of the border stations, and to increase their throughput capacity. This priority task should be completed in 1990. Its main goal is a 30-50 percent reduction in idle times for trains and cars at border stations.

The organization of international passenger transport is very important. The basic task in this sphere is to put the presently existing Agreement on International Railroad Passenger Traffic (SMPS) into accord with the constantly changing conditions. The work staff of the OSZhD Committee and specialists of the transport ministries, cooperating within the framework of the Commission for International Passenger Traffic, are studying a group of passenger problems. They include the conditions for transport, rates and compilation of train schedules and passenger service en route and at stations. Included here is information for passengers, seat reservations on the trains, the service conditions for passengers in sleeping cars and also provision for them at the stations and on the trains.

Problems of improving international passenger transport and raising the service level for the passengers have become increasingly important recently. In particular, a network of international express trains of the Interexpress type has been created. OSZhD specialists are also studying the problems of increasing the speed and safety of train traffic, of reserving seats by computer and of using modern equipment to raise the quality of passenger transport.

The basic activity of the OSZhD is scientific-technical cooperation. In the 33 years of the organization's existence, studies have been made of 189 subjects. Of them, 104 are related to passenger transport, 56—to motor vehicle transport and highways, and 22 have been devoted to transport medicine. As the result of this joint research work, railroad and motor vehicle transport enterprises have introduced modern technological processes, and increased the reliability of the devices. In particular, polymers have been widely used in designing a contact-wire system for electrified lines, the use of computer equipment has been expanded, etc. Some 817 bilateral protocols have also been established, on the basis of which exchange of technical documentation and delegations of specialists have been implemented. The results of the scientific research work are expressed in the numerous norms, orders, decrees and recommendations issued in the form of OSZhD memorandums.

In the past few years the Committee has done a great deal of work on increasing the reliability of the technical devices, improving and developing the technical base of railroad transport, improving the maintenance and repair of rolling stock, the upper structure of the track and engineering structures, STsB devices and connections and electrification and power supply for the railroads. The prerequisites are being created to automate the transmission of data on transport among the railroads. Recommendations have been drawn up on creating operations and freight control systems, introducing micro-computers at stations, taped information exchange among railroads, the use of onboard computers

on locomotives and interaction support of systems for electronic seat reservation in international passenger traffic.

OSZhD contacts with other international transport organizations are being developed and strengthened. The close ties of the OSZhD with the Permanent CEMA Commission on Transport Cooperation have become traditional. In addition, the OSZhD Committee performs active joint work with the Committee on Interior Transport of the European Economic Commission of the United Nations, the International Railway Union (IUR), the Bureau of the Common Freight Car Fleet (OPV), the Bureau of Joint Use of Containers (SPK), the Central Bureau of International Railway Transport (OTsTI), the International Committee of Railroad Transport (TsIT) and other organizations.

Of the numerous directions and projects of cooperation with the Permanent CEMA Commission, we should note the rules of transport and rates in international passenger and freight traffic and the development of technical devices and their service and repair. This work makes possible more efficient use of the specialists and devices at the disposal of the two organizations.

An important role is played by the interaction with the Committee on Interior Transport of the ECE of the UNO [European Economic Commission of the United Nations Organization] and the IUR, since these organizations have a direct influence on the development of the most important sectors of transport in Europe and beyond it. The activity of the joint OSZhD/IUR work groups also deserves a favorable evaluation. They are concerned with problems of developing and introducing railroad automatic coupling, international automated data transmission systems, coding transport objects and automating seat reservations, as well as electronic bills of lading. The cooperation with the OTsTI, within the framework of which joint work is carried out to make the texts of the SMGS and TsIM similar, yields particularly valuable results.

Information on the activity of the OSZhD Committee and its auxiliary organs, as well as on the resolutions and recommendations adopted by them are regularly published in the OSZHD BULLETIN, issued six times a year in Chinese, German and Russian. This publication has for 32 years been popularizing the advanced experience of the OSZhD member countries in the sphere of railroad and motor vehicle transport, as well as highways.

The Soviet reader will be particularly interested to learn how Soviet railroads participate in the work of the OSZhD. By scale of passenger and freight transport, as well as from the standpoint of technical equipment, the SZhD [Soviet railroads] are the largest railroad organization. The participation of the SZhD has corresponding weight in the work of the OSZhD. Soviet specialists are the representatives of the Commission on problems of cars and dimensions, traction and electrification and coordinating work on the use of computer equipment and information devices in transport.

Soviet railroads direct work on two of nine priority problems of the OSZhD. The first of them is the development and introduction of technical and technological organizational measures to ensure an increase in the average weight of a freight train, particularly on lines of international importance. The second problem is related to developing technology and technical devices to ensure the reduction of manual labor in routine track repair. In addition, Soviet railroad workers take an active part in working out many of the themes which are the subject of scientific-technical collaboration within the framework of the OSZhD. The major achievements of Soviet specialists and scientists in railroad transport are known throughout the world.

In 1989, as we know, the Soviet railroads are the organizers of the 25th IRCA Congress. During the work of the Congress, many problems will be discussed that are of mutual interest for railroads of all the continents. I am sure that this international exchange of opinions will help to take a further step forward in the sphere of railroad transport development. With respect to this, permit me, through the journal ZHELEZNODOROZHNYY TRANSPORT, on behalf of the OSZhD, to wish all the participants in the Congress good results and great success in their work.

Transcontinental Mainlines

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[Article by A.A. Avetikyan, doctor of Technical Sciences, and V.V. Kondrashov, engineer]

[Text] Our country's active foreign policy work, directed toward the creation of a world fellowship, developing under the conditions of safety, mutual cooperation and trust, is giving new impetus to the process of international division of labor. Today possibilities are opening up, unthinkable even in the recent past, of drawing into the world economy the industrial and agricultural potentials, the labor resources and the natural riches that have formed in various regions or continents. Energy, ecological and food problems have become global in nature. Cooperation among such major economic associations as the EEC, CEMA, ASEAN, SAARK, etc., is on the agenda. The work of regional commissions and specialized institutions of the United Nations has been activated.

The integration of international social-economic forces, the successful embodiment of which is unthinkable without adequate transport support, makes it possible to take a new look at the balance of material flows in interregional and intercontinental communications, and at

their distribution among land, water, air and underground types of transport. Each of these types of transport has its own periods of take-offs and landings, connected with the distribution of productive forces and the geographical reciprocal disposition of territories, with the ecological features and, especially important, with the energy potentials of individual countries. All this is fair and in conformity with the problem of satisfying the needs of the population for travel, tourism and migration, which have increased with the stabilization of the world and the growth of mutual understanding of the nations on the earth.

The special features of the location of the population and the industrial centers that have been formed should also be dwelled on. Out of the 5.1 billion persons living on the earth, over 2.9 billion live in Asia, while in Europe the population is only 690 million, in North and South America—670 million, in Africa—553 million and in Australia and Oceania—only 25 million persons. Therefore, 60 percent of the earth's population lives in Asia, while 45 percent is concentrated in Southeast Asia—the PRC, India, Indonesia, Pakistan, Bangladesh and the SRV. Characteristic of the Asian region, consequently, is not only a unique concentration of people, but also the largest consumer market in the world.

As for the centers of industry (not counting the USSR and the CEMA member countries), it is commonly accepted that there are three such centers in the world: North America, Western Europe and Japan. They have 40 percent of the world industrial production. The portion of the CEMA member countries is 40 percent, including 20 percent for the USSR. A characteristic feature today is the arising of so-called "new industrial countries" in Latin America and South and Southeast Asia, where the industrial share in the gross national income is growing intensively. The result of this, for example, is the doubling of the index of growth rates in the manufactured-product industry in the developing countries of South and Southeast Asia in the period from 1975-1985. Today the industrial potential of the industrially developed socialist and capitalist countries is on the whole adequate for the needs of the earth's population under the condition of coordinated and mutually advantageous division of labor among these centers of industry, the owners of raw material resources, conventionally called regions of the extracting industry, and the territories of agricultural production.

Naturally, for the creation and functioning of the world economy, there must be reliable, continuously operating and safe transport service. As has been shown by over 150 years experience in operation, railroads possess these qualities in greatest measure. They operate stably in all climatic belts of the earth—polar, subtropical, tropical—in any weather and with the best ecological indicators. Railroad transport has no equal in its potentials for access to any place on earth: city or rural area, coastal or natural landscape. This type of transport is also attractive because it provides the opportunity of direct contact among the people and ensures the maximum view from the train for tourist passengers.

The total extent of the railroads of all the continents is over 1.3 million km. This figure pertains to the operating length of the main routes, i.e., does not take into consideration the branches at stations, the extent of approach tracks to industrial and agricultural facilities, etc. It is calculated that the total extent of transcontinental lines penetrating Europe, Asia, Africa, North and South America and Australia is only 50,000 km, i.e., not more than 4 percent of the total extent of railroads in the world. A considerable portion of these lines has been operating for many years, based on virtually unique traffic organization principles. The difference amounts mainly to the non-identical track gauge, the type variety of technical devices and the extent of automation of the control processes.

Let us examine, in order of priority, the existing and future transcontinental and intercontinental rail service routes, on the basis of which a trans-earth supermainline railroad can be created.

The Material Basis

With respect to the "length of service" in operation and freight-intensiveness, the Transsiberian Mainline, intersecting Asia laterally from the Urals to the Far East, can be named first among these. In 1991 this mainline, with an extent of over 7000 km, will mark its 100th anniversary. Even though a Trans-European line from the Atlantic to the Urals was constructed before the Transsiberian, no transcontinental through traffic transport was carried out along it until the Transsiberian appeared. These two transcontinental railroads, joined together and constituting an intercontinental transit railroad mainline, connect the Atlantic Ocean with the Pacific. This mainline can be called Transeurasian. At a number of points it emerges onto the PRC railroad network, and farther on into the countries of the Pacific Ocean subregion. The world economic significance of the Transeurasian Railroad Mainline (TEAZhM) is indisputable for its time and is still more promising in the future.

Running virtually parallel to this mainline in the latitudinal direction, the Transasian Railroad (TAZhD), about 14,000 km long, should connect Eastern and Western Europe with Southeast Asia. The TAZhD project, which combines the national railroad lines of a number of countries from Turkey to Singapore, is being put into existence, but its realization involves a number of problems, which will be mentioned below. At the same time, it is now clear that the creation of the TAZhD and the extension in the future for this mainline in the eastern direction will make it possible not only to provide through land service for the subregions in which a large part of the earth's population live, but also to connect up the Eurasian railroad routes from the north and south.

When examining the railroad services between Europe and Southeast Asia, one cannot help but mention the fact

that by 1991 the construction of 240 km of a section connecting the railroad junction of Urumqi (PRC) with the Druzhba station (USSR) will be completed. This will cut by almost one-fourth the route from Europe to the Central and Southern regions of China and its Pacific Ocean ports.

It can therefore be stated that the TEAZhM, which has already been operating successfully for many years, as well as the railroad artery from West to East, based on the sections of the TAZhD existing and under construction, can become the future Transearth Railroad Supermainline (TPZhSM).

The network of North African (Trans-Magrib Mainline through Egypt) and East African railroads is directly adjacent to the TEAZhM and the western wing of the TAZhD. With the construction of relatively short intermediate lines, the two African railroad networks, joined in the Arab Republic of Egypt, through the territories of Israel, Palestine, Lebanon and Syria, will gain an exit onto the European railroad network, and through Turkey or Iran—to the Soviet railroads. As a result, after joining with the TEAZhM, the African roads will turn into a unified railroad network for the Eastern Hemisphere.

African railroads at present have a total extent of 100,000 km. This century the railroad network of this continent should double. This is evidenced by the numerous projects being carried out in all the African countries. The extent of the Trans-North African (with completed construction of the Libyan section) and the Trans-East African railroad mainlines (with completed construction of the sections in southern Sudan and southern Egypt) will be a total of 10,000 km. Therefore, the transcontinental routes in Africa will not exceed in extent 10 percent of the length of the railroads existing there, or 5 percent of the total extent of African railroad lines after the completion of all the projects planned. According to evaluative data, Africa has up to 35 percent of the undeveloped world resources of raw material and fuel, and its emergence on the world economic market through railroad service promises technical, technological, economic, and ultimately—social progress for this continent, the most backward with respect to goods production per capita.

In order to complete the joining of all four continents of the Eastern Hemisphere by a unified railroad network, Australia must fulfill its striving to solve its foreign transport problem. The point is that the potential raw material, industrial and particularly agricultural potentials of this country are actually not fully utilized, because of the saturation of the domestic market. After all, only about 16 million inhabitants live on a territory of about 8 million square km. The expense of transporting natural raw material and agricultural products holds back the state's foreign trade turnover and inhibits its active participation in the world economic process.

For example, for each inhabitant here there are almost two head of cattle and 10 head of sheep and goats, and the yearly meat output exceeds 150 kg per person. The meat production and grain harvest can reach a level 10-fold higher than the internal demand, and can substantially increase the volume of national export. The inadequate transport infrastructure, however, substantially holds back this process. Australia has 41,000 km of railroads in internal service, but they are poorly loaded with transport.

The country places great reliance, from the standpoint of contribution to foreign economic activity, on completion of the construction of the TransAustralian Railroad from North to South. A large part of it (from Melbourne to Coondambo) has recently been operating, the section from Coondambo to Alice Springs is already completed, and the southern segment is under construction. The meridional route intersects with the earlier constructed West-East mainline, which connects Sydney and Perth and is continued along the most inhabited part of the continent. If one considers that the entire eastern seacoast is also served by a coastal railroad, it can be stated that the rail exit to Darwin, which is the main port in the north of the continent, opens up a "ferry window" through Indonesia to both the railroads of the PRC, India, and other countries of the region and to the aforementioned transcontinental and intercontinental mainlines of the Eastern Hemisphere.

Separated by the Atlantic Ocean, the Eastern and Western hemispheres, it would appear, cannot have any railroad service between them. The narrow strip of the Bering Straits between Chukotskiy (city of Uelen) and Alaska (city of Wales) separating the mainland, however, is fully surmountable with the aid of modern railroad ferries. The expedience of setting up this connection is also manifested by the already common economic characteristics of the American continent. With the territory of North and South America being 24 and 18 million square km, their population constitutes respectively 400 and 270 million persons. Industrial production in the United States alone reaches 40 percent of the level of industrial production of all the countries of the capitalist world included in the Organization for Economic Cooperation and Development (OECD).

The difference in population density and imbalance in the location of the productive forces has led to intensive relocation of raw material, industrial products and human resources in the latitudinal and meridional directions. The railroad network of the United States and Canada is 300,000 km. Through Mexico, with a railroad extent of 16,000 km, and the countries of Central America, the railroad network of both parts of the mainland could be united into a whole. In the future, the basis of the Trans-Latin American railroad will obviously become the Brazilian projects, based on the use of the Brazil network (total extent 30,000 km) and the Argentine network (34,000 km). At present, to create a Trans-Latin American route from North to South it appears most attractive to use the lines of Colombia, Ecuador, Peru, Bolivia and Chile.

Therefore, a Trans-Latin American railroad network, merging with the railroads of the United States and Canada, will go right up to Alaska in the region of Fort Nelson (Canada). The project, developed in the United States, for an Arctic Railroad Mainline specifies connecting Fort Nelson with the Alaskan Railroad in the region of Anchorage or Fairbanks, which will make it possible to obtain an exit to the shore of the Bering Straits. For this there must be constructed up to 5000 km of railroad, which will constitute a small portion of the already existing network. Completing construction of the missing sections will make it possible to create a unified Transamerican railroad mainline from the Straits of Magellan to the Bering Strait. On USSR territory, to meet it, as a continuation of the Amur-Yakutsk Mainline (AYaM), presently being constructed, the Magadansk Railroad can be laid, which will extend into the region of Anadyr and on to Uelen. These are practical potentials for creating a land railroad connection among the four inhabited continents of the earth.

The unified railroad network includes a ferry crossing of the Bering Straits and bridge passages across the Suez and Panama canals. In consideration of the experience of laying a tunnel under the English Channel, the introduction of which is planned for 1993, and the world experience accumulated in operating railroad-sea ferries, it can be stated that the technical difficulties involved in connecting the Australian section to the Transearth railroad supermainline will be surmounted. It is fully possible that Japan will also be attached to the world railroad network, using the existing or modernized ferry bridge in the Soviet Maritime area for this purpose.

Economic Factors

It is also expedient to analyze the comparative technical-economic indicators characterizing railroad service in the Western Europe-Southeast Asia direction, through USSR territory, as well as by means of the TAZhD. This type of approach, methodologically, is basically applicable to other transcontinental and intercontinental railroad mainlines.

First of all, let us examine some data characterizing the foreign economic activity of the USSR, since the export-import freight transport, transit through our territory and the development of the growing passenger turnover is an essential part of this activity. Soviet foreign trade organizations have fruitful business ties with 145 countries and thousands of foreign firms. Over 60 percent of the freight turnover falls to the socialist countries, about 27 percent to the developed capitalist countries and 12-13 percent to the developing states. The share of railroads in these ties is determined either by the presence of direct ground rail service or by the organization of mixed transport, using related types of transport, particularly maritime ferries.

In speaking of the freight turnover with socialist countries, it should be noted that the share of Eastern European countries is over 50 percent of its total volume. Of the West European capitalist countries, the greatest volume of freight transport falls to Finland, the FRG and France. An analysis of the developmental trends in mutual trade relations between the USSR and the capitalist countries of Western Europe shows that the potential existing in the sector is not fully utilized, and the country's transport communications can be considerably more heavily loaded with foreign trade freight.

Undoubtedly, the radical restructuring of our country's economic system will permit the scientific, technical and production potential of the Soviet Union to play a substantially greater role in world economic ties. Reorientation of our export, replacing the export of a certain portion of raw material with other commodities, reflecting the country's huge industrial potential, are specified. In turn, this will lead to an increase in railroad transport, particularly of general freight, and to an increase in transit through the USSR. Work in the sphere of providing for the intensifying demand for transport output is already in full swing. For example, the Ministry of Railways is implementing measures for guaranteed top-priority supply of cars for export products.

The services of the SZhD [Soviet railroads] through the Transsiberian Container Service (TSKS) has been considerably developed within the framework of transport ties between East and West. Lines existing for over 20 years serve 25 countries of Western Europe, Asia and the Far East. Transport here has increased progressively, and from 2000 containers in 1971 reached one million in 1982. In 1987, about 30,000 containers were transported from west to east, and in the opposite direction—about 45,000. The most complex unit of the TSKS system is the railroad section, which is about 75 percent of the total extent of the route. Because of the difficulties of tracking the movement of individual or even groups of containers in freight train consists, as well as to accelerate transportation on the SZhD, the route train technology was introduced, and today has been imitated by foreign transport, as for example, by the Interkonteiner Association. In 1986, the transit speed for TSKS was ensured within the range of 607-667 km per day, and recently, for direct container trains in the schedule for SZhD, a special "line" has been laid which makes it possible to reach a route speed of up to 808 km per day.

On the railroad arm of the TSKS, maximum use is made of specialized-fitting platform-container-carriers, ensuring the formation of route trains, consisting of 100-106 containers (scaled for 20-foot containers). At the same time, the TSKS also receives 40-foot international standard containers for transport, the proportion of which in the total transport volume is about 40 percent. The TSKS transports not only loaded, but also empty containers—mainly from the countries of Western Europe and Iran to Japan and from Iran to Western Europe.

The volumes and correspondence of freight have undergone substantial changes during the time that the TSKS has been operating. For example, the specific amount of

freight proceeding from the FRG eastward in the period from 1980-1986 dropped from 30.9 to 7.6 percent, while 23-28 percent of all the freight transported on the TSKS regularly runs west to the FRG. Conversely, the freight flow from Finland increased from 14.6 percent of the total transport volume in 1980 to 45.1 percent in 1985, remaining at the 10-15 percent level in the opposite direction. To a certain extent, this is because of the changes in the structure of foreign trade in Finland, where in the last few years there has been an active development of economic ties with the South and Southeast Asia region. On the other hand, the long distance and relatively long passage of export-import freight along the Transsiberian route is the obvious reason for the very modest proportion of containers running to France—not over 2-2.5 percent yearly.

Although the container turnover on the TSKS (75,000 units a year) is quite sizable, it constitutes only 10 percent of the total container turnover between East and West. Because of the limited throughput capacities of the Transsiberian, it is so far difficult to increase the container flow along the TSKS. With the development of the network, specified in the plans for the coming years, however, and the corresponding data base organization and support, the volumes achieved, according to IKTP [Institute of Complex Transportation Problems] estimates, can increase four-fold by 2000-2005 and reach 300,000 units. Organizing the movement of container train-turntables for stable schedules with a speed of up to 1000 km a day, will make the TSKS even more attractive for the clientele. Increasing the products list of container-transported freight, reequipping on the basis of complete mechanization and automation of the container terminals at the ports and at border stations will contribute to an expansion of the number of countries using this route.

The length of the route traveled by a container when running on the Transsiberian is 13,000 km. The distance between the Atlantic and the Pacific Ocean region by sea is twice as great. The land route can become four-fold faster in time, and one-fourth cheaper than the sea. The advantage is indisputable, and the construction of the Baykal-Amur Mainline, being completed in the planned volume, will make it possible to achieve a further improvement in the TSKS economic indicators.

At the same time, to increase the competitiveness of the Far East-USSR-Western Europe route, measures for the organizational, legal and technological procedure are already being implemented. Among the most important of them are: creating a legal institute to draw up, with the freight owners, a contract on freight transport in combined traffic; organization of an international automated system of tracking the movement of freight and containers, gathering and issuing information; centralization of attracting freight on the world market of freight and transport services; solving the problem of unlicensed passage through the USSR of all ordinary commercial foreign freight; use of a unified tariff.

The latter may be implemented within the framework of a joint mixed enterprise made up of those participating in freight transport in TSKS traffic. To simplify membership in this mixed enterprise, an Association of Soviet Railroads could be created within the framework of the Ministry of Railways. This association would enter into the mixed enterprise as a single stockholder or shareholder, into which the recently created Zheldoreksport firm would enter as a full member. The mixed enterprise, in addition, would combine a number of shipping companies and ports, represented in centralized fashion by the Ministry of the Maritime Fleet, as well as subdivisions, with a great deal of shipping experience, of the Ministry of Foreign Economic Relations or shareholding companies created on their basis.

Additional Possibilities

When speaking of the development of railroad transport, the progressive increase in passenger transport should particularly be mentioned. At present the SZhD has agreements on the transport of passengers and baggage with 27 countries in Europe and Asia, including 15 capitalist countries. Soviet sleeping cars are running in 24 countries in 77 direct passenger services with a total extent of about 200,000 km. In addition to Moscow, Leningrad, Kiev, Minsk, Vilnius, Lvov, Riga and Kishinev have become major centers of international passenger transport.

In 1986-1987, 305 Soviet cars were running in international passenger service in the summer, and 173 in the winter. During 1987, about 4.5 million persons were transported, and the passenger turnover exceeded 5 billion passenger-km. On orders from Goskominturist, in 1987, 522 additional trains were designated, including 11 trains from Austria, Belgium, Great Britain, Spain, Finland and the FRG. It is expected that by the year 2000 the tourist transport volume will increase by a factor of 2-2.5. The Ministry of Railways has adopted a resolution on reliably making cars available to transport tourist groups from other countries to the USSR, as well as in one-third of the country for transit through the USSR. Measures are being taken to create specialized trains made up of new passenger cars and new dining cars for the tourism developing, both on the territory of the USSR and with a stop in other countries, as well as special ones for tourist groups passing through our country in transit. It is in this way that routes were organized for those who traveled from Western Europe to South Korea for the 1988 Olympic Games.

The Soviet Union is carrying out preplanning work to create new express mainlines with speeds of up to 300 km/hr, and is adopting measures to increase the speeds of passenger trains to 200 km/hr on existing lines. It is characteristic that active work on creating internal and international express lines has been developed in Italy, the FRG, France and other countries. The express systems of Intercity, Intercityeksperimental, TEE, and others have become widely known. This year the TGV-Atlantique line will be put into operation in France. It

will connect Paris with the Atlantic seacoast, passing through 24 departments of the country, where 22 million inhabitants live. It is assumed that as early as 1990 this line, the speed on which reaches 300 km/hr, ill serve up to 40 percent of the French railroad passengers. Within the framework of the Committee on Internal Transport of the ECE UNO and other international transport organizations, the possibility of joining the lines mentioned with the planned SZhD express lines can already be discussed.

The total extent of express railroad lines in the world is now about 3000 km. The experience accumulated in Japan, where express traffic has a 25-year history, and in Western Europe, is convincing evidence of the attractiveness of railroads not only for personal, family, group or tourist trains, but also for workers. The comfortable conditions of the trip, the various opportunities for diversion and looking around at the adjacent locality (including motor vehicle excursions during stops at the stations), the presence of individual compartments for meetings, with the most modern equipment, the possibility of telephone connections with any point in the world, the special compartments for nursing mothers, families with many children or invalids and elderly people—all of this makes it possible to attract to the railroads up to 80 percent of the motor vehicle owners, up to 60 percent of air passengers for a distance of up to 800 km, up to 50 percent of bus passengers on routes of over 100 km, and also new categories of passengers. The period for recoupment for such lines is not over 10 years. Hence, the conclusion may be drawn as to the possibility and economic effectiveness of allotting, for future Transearth railroad supermainlines, special express passenger routes, as well as that of introducing individual trains for intercontinental service.

In speaking of the development of railroad transport on an earth-wide scale, we cannot fail to dwell on the efforts undertaken in this sphere by the United Nations Organization. Measures pertaining to modernization, renovation and construction of new lines and to increasing the operational effectiveness of railroads, incorporated into the Program for the Third Decade of Development of the UN in the 1980's, and in accordance with the medium-range plan for 1984-1989, approved by the UN General Assembly at its 37th Session, have been adopted for execution. The Decade of Development of Transport and Communications in the Asia-Pacific Ocean Region for 1985-1994, announced by the Economic and Social Commission of the UN for Asia and the Pacific Ocean (ESKATO), specifies carrying out a multipurpose strategy of action to realize the potentials of railroad transport. Within the framework of the Decade, the basic components of strategy for developing the railroads of the region were determined, and a specific program of action in this sphere was worked out and has begun to be put into practice.

In particular, within the framework of the Decade, attention to TAZhD will be intensified. The completion of its construction (particularly in the Western and Central sections) will lead to a qualitatively new state of transport service for the South and Southeast Asia region, and will open up the possibility of intermodal railroad-maritime technology for freight transport. This pertains primarily to general freight, which can be relatively easily containerized, and which, consequently, can be efficiently processed at the ports of Bandar-Abbas, Karachi, Calcutta, etc.

The need to develop interregional and subregional land service is caused by the very structure of foreign trade in the countries of the ESKATO region. Suffice to say that in 1985 the export of the developing countries of the region to the developed countries was over 53 billion dollars. At the same time, the proportion of Western Europe in this export exceeded 22 percent. In composition, this is primarily raw material goods, food products and energy carriers, but beginning in the 1970's, export to Western Europe of semi-manufactured products and industrial goods was also developed. In turn, import of the developing countries of the ESKATO region from the developed countries consists almost 80 percent of finished products of machine building and other industrial sectors, and 20 percent of food products. Western Europe's share in the import of these countries is 31.2 percent, and in the last few years has remained virtually unchanged.

The yearly volume of foreign trade of the countries of South and Southeast Asia, however, for example, from the FRG, France, Sweden and Finland, taken together, does not exceed 14-15 billion dollars, both for import and for export, which clearly does not correspond to the potentials of the partners. A further increase in trade is to a great extent held back by the inadequate transport provision. Hence the striving of national administrations, international organizations, as well as private firms, to increase investments in building and modernizing railroad sections, stations, freight centers and port terminals, in order to ensure the development of progressively growing container flows. According to expert evaluations, by the year 2000 the transports of containerized freight will encompass up to 80 percent of freight transports between European and Asian regions and will constitute about 1.6 billion tons a year.

Railroad routes are becoming the unquestionable alternative to purely maritime interregional service. A comparison made, as applied to the delivery of freight, for example from the FRG (Hamburg) to the ESKATO region (Singapore), shows that even the use of modern container ships on the routes does not ensure the competitiveness of transport by sea, because of the almost double increase in the length of their route over the length of the railroad route, as well as because of the long idle times for loading-unloading operations at ports, reaching five days.

It should also be noted that of the two purely railroad variants of freight transport from Europe to the ESKATO region—through the territory of Turkey or through the USSR—the latter has obvious advantages.

The average transit time through Turkey to Iran is 1.8-fold greater than the time for this transit through the European part of the USSR. The presence on the Turkish route of two ferry crossings—across the Bosphorus and Van Lake—not only delays the movement of the consists, but also reduces the safety of the freight transport. At the same time, attracting to us a more substantial share of this transit freight flow requires an increase in the throughput capacity of the SZhD on the Transcaucasus sections, as well as, as was noted above, an improvement in the customs procedures.

Because of the unfinished state of the TAZhD plan, and also for possible transport of freight to the regions east of Singapore, it is at present expedient to implement mixed, intermodal technology for freight transport. The existence for the TAZhD of an exit to the main ports of the Indian Ocean makes this mainline competitive with purely sea service, even for freight flows which it is inexpedient to send along the Transsiberian, for considerations of economic effectiveness. The organization of mixed transport in intraregional service on the basis of TAZhD also gives the states participating in the transport process the advantage that it permits them to save currency through attracting to sea transport relatively poorly equipped ships of national shipowners and refusing service to line transporters.

It appears that numerous difficulties must be overcome to put a Transasian railroad into operation. Among them are—the varied track gauges of the railroads, the varied type-size of the rolling stock and the lack of similarity in the signalization and blocking systems. These difficulties can be surmounted by having the ESKATO member countries carry out a unified technical policy, wide-scale standardization and unification in the construction and maintenance of technical devices, use of a coordinated STsB [signalization, centralization and block] system, etc. This entire set of measures should be coordinated by the regional UN Commission and its specialized institutions.

As for the organizational and technological measures contributing to the development of freight and passenger transport by the railroads of the world, a considerable amount of experience in this work has already been accumulated within the framework of the United Nations. It is sufficient to name the "International Convention on Facilitating Railroad Freight Transport Across State Borders," signed as far back as 10 January 1952 in Geneva, the "European Customs Convention on International Freight Transport Using the Books of the MDP" (Geneva, 14 November 1975), and the "European Convention on Customs, as Applied to Pallets Used in International Transport" (Geneva, 9 December 1960). Of particular importance from the standpoint of using railroads as components of intermodal routes is the "Convention of the United Nations Organization on International Mixed Freight Transport," adopted by the Conference of the United Nations Conference on Trade and Development (UNCTAD) of 24 May 1980.

The idea of a transearth railroad supermainline will obviously be carried out in the 21st century. It can be hoped that it will become a century of further integration of efforts of the civilized world to develop industrial and agricultural production, and maximally saturate the market with consumer goods. The extent of containerization and packeting freight, making possible broader introduction of automated or robotized freight transport, will sharply increase. Satellite space communication will make it possible to control the location of each consist, the state of the cars, locomotives and railroad track formation. The dispatcher centers can supervise the execution of traffic schedules by means of remote control devices and table displays. Double and triple reserve control will make it possible to eliminate negative phenomena in the processes of freight and passenger transport.

The appearance of a unified worldwide railroad system does not lessen the importance of maritime, river, motor vehicle, air and pipeline types of transport, the use of which has developed in the last few decades of the 20th century. It is the railroads, however which will to an increasingly great extent play the role of the key type of transport, dominating international transport. The active and constructive work of international organizations, regional UN commissions and also the international transport organizations—IRCA [International Railway Congress Association], OSZhD [Railroad Cooperation Organization], IUR [International Union of Railways], SAZhD, SEZhP, MATZh and others—in conjunction with the governments and national railroad administrations, make it possible to give new impetus to the development and improvement of transcontinental, subregional and national railroad networks and ultimately to realize a unified world railroad complex, tremendous in its scale and role in the life of the people.

The Technical Program of the 25th Congress

18290186g Moscow ZHELEZNODOROZHNYY TRANSPORT in Russian No 4, Apr 89 pp 34-40

[Article by Ye.A. Sotnikov, technical president of the IRCA Congress [International Railway Congress Association], doctor of Technical Sciences, professor]

[Text] **World railroads have now spread over more than 1.1 million km. The volumes of freight transport fulfilled by them in Europe, America, Asia, Africa and Australia constitute 7.4 billion ton-km. Railroad transport carries billions of passengers every year.**

The technical potential of this transport sector is great. Electric and diesel haulage has firmly occupied the leading place in transport. Specialized cars and containers are widespread. Heavy types of rails have been laid on the route. The stations, depots and dispatcher centers are equipped with modern computer systems. The basic production processes are automated and mechanized.

The development of production forces and the infrastructure in modern society is unthinkable without railroads, although their role is different in different countries. In some states, it is the main form of transport, and in others the railroads fulfill a relatively small part of the total transport volume. Everywhere, however, they have specific spheres of use, be it transport of suburban and intercity passengers, mass transport of freight such as coal, ore, timber, cement, grain, motor vehicles and certain other products, or transport of finished products, food and industrial goods in containers on the "door to door" principle.

Many countries are seeking effective ways of developing railroad transport and improving its technology. This work is directed toward a further increase in transport, the creation of powerful complexes for the throughput and processing of cars and an increase in the freight mass transported simultaneously by each train. For example, the USSR is handling 100 trains and more per day each on many lines, and the average freight-intensiveness calculated per kilometer of network length is about 28 million ton-km a year. The capacity being worked out for modern large shunting stations in Canada, FRG and a number of other countries reaches 8-10,000 cars a day. The United States regularly handles freight trains weighing 20,000 tons.

Widescale inclusion of the USSR and other countries in international division of labor requires an increase in international transport volumes and broadening the cooperation of railroads and railroad companies, and accelerating the technical progress on the rails. Ye.A. Sotnikov, technical president of the Congress, doctor of Technical Sciences, professor, tells us about the set of problems to improve the organization of the transport process and raise labor productivity in railroad transport, which will be discussed at the 25th IRCA Congress.

The thematic coverage of the problems introduced for discussion at the coming congress is in many ways determined by world trends in the development of railroad transport, which in recent decades in many countries has been waging a sharp competitive battle with air, motor vehicle and other types of transport. This required technical modernization, not only on the basis of the most modern scientific achievements, which are used, particularly, to create high-speed specialized mainlines, but also on the basis of a new economic approach to transport organization, systematic study and analysis of the market for services and a rise in the interest of railroad workers in the results of their work.

For Soviet railroads, the workers of which have made the transition to full cost accounting and self-financing and are persistently seeking a new path in the economic reform being developed, foreign experience and the approaches of leading specialists in the sphere of organizing transport processes and transport economics are of the most practical interest. On the other hand, for foreign specialists participating in the congress as well, our experience in organizing the transport process under the conditions of the huge volumes of freight and passenger transport, with the most intensive load on railroad lines in world practice, is important. The combination of these two approaches, the opportunity for direct discussion of urgent problems in the work of railroad transport and various ways to solve them within the framework of free discussion, will undoubtedly contribute to the further development and increased effectiveness of the work of railroads in various countries, acceleration of scientific-technical progress and the development of economic methods of management.

Railroad representatives of over 20 countries in Europe, Asia, Africa, North and South America will speak on problems of the basic subject matter at the Moscow Congress. Their speeches and reports are grouped in three sections, each of which includes, in turn, two or three groups. In addition, a "Round Table" meeting will take place, at which specialists and scientists will exchange opinions on problems of improving the organizational structures of railroad transport management, etc.

The work of the first section of the coming symposium will be devoted to an improvement in passenger transport. After all, this is now one of the most important problems for many railroads. The swift development of high-speed mainlines in Japan and Europe, including specialized ones, which will gradually be combined into an all-continent unified express service system, is based on painstaking study of the needs for passenger transport and service systems for passengers, offering them services and use of the newest technical devices.

At the meetings of the first group of the section, representatives of European railroad organizations will speak about their approaches to studying the need for passenger transport, based on an analysis of the passenger flows in the zones of the large city conglomerations characteristic of Western Europe. Great attention will also be paid to improving the methods of study, including forecasting the demand for passenger transport.

The experience, achievements and problems of Soviet railroads are scheduled to be presented in the light of the tasks of passenger transport management on the basis of the automated Ekspress-2 system. B.Ye. Marchuk, a recognized specialist in this sphere, will acquaint the participants in the congress with the considerable achievements of domestic railroad transport in creating modern space reservation, which corresponds to the world level in a number of parameters.

It is electronic space reservation systems that are becoming the instrument which will make possible, quickly and on a unified basis, the solution to various organizational-technical problems involved in providing high-quality service in passenger traffic. In the future, an international computer network of electronic reservations, including the leading European countries, will have about 40 computer centers and 20,000 terminals, operating on an actual time scale. Moreover, over half of all

the computer centers—22, including 16 on Soviet railroads, will be operating on the railroads of the countries included in the OSZhD [Railroad Cooperation Organization]. The total capacity of the international computer network will be about 10 million reports a day.

The further development of international passenger transport in Europe, in consideration of setting up a high-speed service network, is the subject of the speech by L.V. Vansink, representative of the Netherlands Railways. High-speed service is an important factor in the railroads' competitive struggle against other types of transport, particularly air transport, which has achieved definite progress in transport organization in Western Europe. Right now the Eurocity system is pitted against air transport. This complex of passenger service in Europe is characterized by a high level of comfort, service, frequency and regularity of train service. It provides for the fullest satisfaction of the population's needs for transport on the railroad service market. The concept of Eurocity, along with the technical conditions, includes establishing a long-range program for its development, including the infrastructure and the rolling stock.

The economic interests of the railroads under the conditions of sharp competition on the transport market play an important role in improving passenger service. In the course of their discussion at the Moscow Congress it is proposed problems of modern marketing in passenger transport be examined. Devoting their speeches to this subject will be Doctor Professor K. Kaspar, representing the Institute of International Transport and Scientific Research in Railroad Transport (St. Gallen, Switzerland), Schnell—doctor and engineer—director of the passenger transport marketing service of the State Railroads of the FRG, and his colleague, H. Esturne, of the National Society of French Railroads.

Their reports will devote great attention to the long-term demand for transport, the price policy, publicity organization, the interaction of railroads of various countries in the struggle for the European market, and the successes of the roads, particularly the Eurocity system, in accumulating passenger transport volumes on the basis of raising the quality of the service and offering various types of services.

At the meetings which will take place in the second group of the first section, representatives of the CSSR, France, Switzerland and Italy will set forth concepts of offering services to passengers in interrelation with the creation of new and modernization of existing technical transport devices. The entire complex of services will be examined, including those in transport of intercity passengers on daily high-speed and night trains, transport of suburban passengers, tourists, etc.

P. Pavlushek, a certified engineer (Scientific Research Institute of Railroad Rolling Stock, Prague, CSSR), will give a detailed description of the rolling stock used in the republic for passenger transport, in consideration of the growing operational and ergonomic requirements, particularly the modern concepts of ventilating and heating devices. The analysis of the potentials for operating double-decker passenger cars in city service will undoubtedly be of interest.

F. Plassar (France, University of Lyons-2, Laboratory of Transport Economics) is preparing a report on the results of the sociological studies that preceded the widescale introduction of TGV trains in the Paris-Southeast service. This train has sharply increased the mobility of various groups of the population, with trips of a distance up to 400-500 km. The studies also showed that at the same time, the number of business trips for information and business purposes sharply increased.

M. Cavagnaro, I. Surans and L. Giuliani (State Railroads of Italy) will speak about the perspectives for high-speed traffic in Italy. Along with summarizing the experience accumulated in creating high-speed lines, great attention is to be devoted to analyzing the cost of constructing the lines, the rolling stock and forecasting the economic results predetermining the perspectives for the creation and development of high-speed lines.

Another representative from Italy—M. Pecchorini, director of the well-known Breda firm—will familiarize the participants in the congress with the high-speed train of the State Railroads of Italy, the ETR: the general approach to structural designs, the hauling characteristics, the technical requirements for the crew, the driver's cab, and also the systems of service, diagnostics and repair. Prototypes of the proposed technical designs will be discussed, the dimensions of the trailing coaches and their weight when empty and the structure of the motor coach will be given. The Breda firm is paying particular attention to solving the problems of aerodynamics and design, the hermetic sealing of the cars, air purification, and freedom of inter-car connections. The ETR train is intended for service with a speed of up to 300 km/hr.

Dr. P. Vinter, technical director of construction of the General Directorate of the State Federal Railroads of Switzerland, will show the basic technical solutions in creating a promising electric locomotive with three-way converters and asynchronous drive. In the opinion of the developers, the structure of the mechanical part of the new electric locomotive provides improved negotiability for the locomotives on curved sections of track. This contributes to increased speed.

The creation of a new electric locomotive is one of the important elements of the vast program of development of public transport in Switzerland, which includes mainly railroad and bus service, allowing for their close interaction. The program specifies reinforcing the tracks and track mechanisms, and construction of new lines.

The participants in the third group of the first section will discuss problems of raising the quality of passenger transport and ensuring its objective management. Also to be discussed here are various aspects of the concept of "quality", including creating comfortable conditions for

passengers, availability of services at trains and at stations, presenting the passengers with varied information in a convenient form, etc.

Representatives of the British Railways—A.D. Tavish, director of passenger service marketing, and D. Maidment, reliability manager—will speak about the use of design in passenger service. Hygiene and comfort as aspects of the quality of railroad transport is the subject of the speech by Doctor A. Serioi, director of Medical Services, and Doctor E. Manafo, chief of the Division of Hygiene and Transport Medicine of the State Railroads of Italy. The report presented at the Congress by Professor A. Klassen and his assistant G. Dahl (Royal Technical Institute, Stockholm), will be devoted to a very urgent problem—the reliability of railroad passenger transport. Representatives of the Netherlands Railroads and the State Railroads of Switzerland will speak on the effect of the current maintenance of rolling stock on the quality of passenger service and monitoring the efficient use of technical devices under marketing conditions.

The report by Professor T. Ino (Technological Institute, Kanadzava, Japan) on the interaction of the high-speed Sinkansen line and ordinary railroads will, in our opinion, be of considerable interest for the participants in the congress. Japan's success in the sphere of high-speed traffic makes this country's experience the object of particularly attentive study. At present here there are almost 1800 km of these lines, and by the year 2000 their extent will increase to 3200 km. Moreover, all the lines are profitable and have tremendous transport volume.

With the 1987 transition of railroads to management by private companies, a number of measures to increase their operational efficiency were presented. Among them was a revision of the stops for high-speed trains, further increase in speeds on the Sinkansen line and ordinary lines, better coordination of schedules at changing points, introduction of new types of cars, etc. Specialists are studying the possibilities of having high-speed trains exit onto individual sections of ordinary lines, for example, through laying four rails on the railway subgrade. Special structures for cars and tracks are being worked out. The solution to these problems will provide many small cities in the country with non-stop service from Tokyo. This, in turn, will increase the passenger flow on the railroads through increasing the attractiveness of the trip and the passenger flow away from motor vehicle transport.

The range of questions examined in the second section of the congress is related to freight transport. This is the study of the need for freight transport (first group), the organizational system of freight transport (second group) and the quality of freight transport and its control (third group).

The speech and reports which will be heard at the first group of the section emphasize the increasing importance of factors such as the requirements of the clientele, the development of dispatch routing and container transport, the urgency of freight delivery, the use of mixed transport, the system of additional services and contractual rates. It is no secret that all these problems are quite topical for Soviet railroads as well.

The developments carried out by the Institute of Transport Research in Zilina, CSSR are very interesting in this respect. The development and modernization of transport services are regarded as a decisive factor in improving the transport process. The speech which will be given by M. Kouzal, engineer, noted that by the year 2000 in the CSSR there will be a substantial change in the transport operation conditions. A reduction is outlined in the proportion of mass bulk freight, which is low in cost, and an increase in the proportion of products of the processing industry, characterized by higher cost. The concept of the so-called "integrated" transport system is examined. It includes all the components of a transport conveyer, and it functions within the framework of the national economic complex with a planned system for handling the economy.

F. Kastely, director of Technical Problems for Hungarian Railroads, will speak about the organization of mass transit shipping through the territory of the Hungarian People's Republic. Increasing the efficiency of railroad transport in this country involves widescale introduction of automated transport process control systems based on computers, which will be introduced in stages. Introduction of ASU in full volume should be completed in 1993.

S. Driver and I. Brown, British Railway specialists, are devoting their speech to the increased competitiveness of railroad transport. Their report will examine the organizational structure for calculating revenues and expenditures, with individual financial responsibility dropped to a lower management level. For confirmation, the authors will give examples of the large-scale solutions of the Railfreight and Freightliner companies, which are directed toward raising the competitiveness of the railroad through introducing permanent control over the quality of transport service, developing a technological chain of transport throughout the cycle and using contract relations between line enterprises. The proposal on using bogies with small-diameter wheels to increase the useful volume of the car is interesting.

K. Nishida, director of the Department of Technical Development of the Division of Freight Transport Technology, will speak about measures to increase the competitiveness of Japanese railroads in freight transport. In the opinion of Doctor M. Leman, commercial director for Freight Transport of the State Federal Railroads of Switzerland, who will speak on "Productive Management—the Future of the Railroads," a sound economic position for railroads under the conditions of sharp competition with other types of transport is impossible without strict regulation of the periods for delivering freight, increased speed for freight trains and constant monitoring of the quality of the transport.

The speech in the second group of the section by V.I. Bodyul, candidate in Technical Sciences (All-Union Scientific Research Institute of Railroad Transport), is

devoted to setting forth technical and technological measures to improve the organization and management of freight transport on Soviet railroads. He will discuss ways to increase the throughput of the roads, the development of sections and stations, improvement of the traffic schedule, and also problems of controlling the transport process on the basis of automated dispatcher centers and the main directions in the technology of transport control. The basic direction for increasing the throughput of the lines for the future is to turn to freight trains with increased weight and length.

Doctors F.A. Viladek, V. Moravski and R. Butsek, certified engineer, (Polish People's Republic) will speak of the development of mainlines in the Transeuropean direction from North to South. This project is to be fulfilled with the financial support of the United Nations.

Doctor G. Kastner, director of the Main Division of Central Management of FRG State Railroads, will present new principles of mass freight transport organization by "programmed" route trains. The technology proposed ensures transport service with guaranteed deadlines for freight delivery, with accelerated headway for the routes. The problems of making freight transport more efficient will be examined in reports presented by United States railroad specialists—V.E. Greenwood, executive vice-president of the Burlington Railroad, and D.G. Dubois, vice-president of the Greenbrier Leasing Company, and by a railroad specialist of the Republic of South Africa—Doctor D.G.S. Koetze, assistant general manager of the Transport Service.

The meetings of the third group of the section will discuss the problems of freight transport quality that have formed, and organizing its control: providing complete information on transport, freight storage, use of specialized cars, precision and reliability of delivery, and simplifying the procedure for filling out freight documents. Widescale introduction of electronic systems when organizing freight transport will permit problems of quality and control to be solved at a higher level.

The United States will present two reports on this problem. G.R. Martin, senior assistant vice-president of the Norfolk Southern Corporation, will shed light on problems of transport quality control and management, including monitoring the provision of freight storage, organizing the work of administrative personnel and operation of terminals, using specialized rolling stock, and widescale introduction of computers. The report by Doctor A.L. Kornhauser, Princeton University professor, will examine the activity of control-measuring service on railroads.

The report by L. Pita, professor at the Polytechnical Institute of Barcelona, on improving railroad service between Spain and European countries will doubtless be interesting to Soviet specialists. The point is that in Spain the track gauge differs from the Western European gauge. To overcome the difficulties that this entails, rolling stock with adjustable wheel pairs has been developed here, and a number of measures have been introduced for its efficient operation.

H. Pohl, director of the Division of the Directorate of State Railroads of the FRG, will sum up the study of problems of increasing the speed of freight trains on a national and international scale. There has been great progress in many countries in accelerating freight delivery. There are still many unsolved problems, however, which hold back increased speed.

We know that the quality of the transport process on railroad lines with a high load level in many ways depends on the plan for the train formation. Doctor J. Plasil (Technical University of Transport and Communications, CSSR), will speak on its development for a freight-intensive network. M. Strens, engineer, representing the National Society of Belgian Railroads, will speak on making transport processes more efficient and increasing transport efficiency.

The third section, which consists of two groups, will examine problems of increasing railroad productivity. The meeting of the first group is to be devoted mainly to problems such as establishing the definition of railroad productivity, studying the necessary capital investments and using human resources and to a comparative analysis of organizational-technical measures. The second group will introduce for discussion the practical tasks of increasing the productivity of means of transport.

Analytical problems related to the methods of calculating economic indicators, which affect railroad productivity, will be set forth by Professor G.P. Baumgartner (Higher Federal Polytechnic School, Lausanne, Switzerland). Of particular interest are the sections of his report analyzing the way of establishing railroad productivity in physical indicators—cars, car-kilometers, ton-kilometers and adjusted ton-kilometers. As we know, it is these precise objective measurers of the work of transport production which have been criticized in the last few years. Because of this, the approach of foreign specialists and their theoretical views on this problem, open to question, will be of particular interest.

Under the conditions of a planned economy, economic approaches to management acquire increasing importance. In our opinion, using the results of the scientific research carried out at the Technical University of Transport and Communications of the CSSR will make a definite contribution to solving this problem. In particular, Doctor Professor J. Mikolas will speak on problems of profitability and its influence on the effectiveness of transport operations.

Representatives of the Danish Railroads, H. Vinter, director of Finance, and G. Hansen, senior associate, will acquaint the participants in the congress with their point of view on the various components of the concept of "productivity" and their use in the system of railroad transport control. D.G. Williams, director of Financial Planning of British Railways, will present for discussion

problems of determining railroad productivity and methods of increasing the productivity of the railroad administrations. A. Kobeira, responsible for strategic study in the Planning Directorate of the Portuguese Railroad Company, will examine the effect of the development of the information system on the management system. Incidentally, we note that the next, 26th Congress of the International Railway Congress Association will be held in Portugal.

In the second group, Soviet railroads will be represented by V.N. Kustov, senior lecturer of the Leningrad Institute of Railroad Transport Engineers. His speech, which will be devoted to the automated control system of the Leningrad Transport Center, is to reveal the problems of territorial-zonal management, using the example of the Leningrad Transport Complex, where containers are processed both at railroad stations and enterprise exchange points, and at maritime and river ports. R. Wente, representative of the well-known Plasser and Teurer firm, will acquaint the participants in the congress with the latest technical innovations in mechanization of routine track maintenance.

Four speakers represent the FRG Union of Locomotive Builders at the symposium: Doctor Professor H. Hochbruch and certified engineers G. Ditting, L. Distelrat and L. Schwendt. They will speak of the effect of modern diesel haulage on increasing the country's railroad productivity and of the new reserves making it possible to increase the savings from using this type of locomotive. L. Dalborg and B. Porle, specialists of the Swedish State Railroads will speak about the policy for efficient use of labor resources as a reserve for increased railroad productivity.

G. Demaris, representative of the National Society of French Railroads, will examine a broad group of technical problems in his report. Of greatest interest will be the problems of increasing freight train speeds to 100 km/hr, creating high-speed networks of freight transport with speeds of 120, 140 and 160 km/hr, automation of the shunting stations and remote control of locomotives. G.H. Way, vice-president, and G.J. Lowrance, assistant vice-president (Association of American Railroads) will devote their report to the search for technological innovations.

An interesting discussion is anticipated at the "Round Table" of the congress. Its theme is improving the management structure and its effect on railroad transport productivity. G. Palmer, assistant secretary (Transport Division) and D.D. Kirby, vice-chairman of the country's Railroad Council, will speak of the role of the British government in the rise of railroad productivity. British railroads, as we know, are state-owned, and not a private enterprise with prescribed obligations. The government does not directly control them, however. The speakers will demonstrate the mechanism of the transport policy in Great Britain and the special features of railroad operation related to their economic activity, financial state, etc. T. Lindholt, director of the Norwegian State Railroads, will discuss similar problems in his report.

S. Yamanouchi, vice president of the East Japan Railroad Company, will report on the rise in railroad productivity in Japan, and on the change in the organization of its commercial activity. We know that with the transition of the Japanese Railroads to management by private companies, their revenues rose considerably. This was furthered by a considerable reduction in personnel, reducing expenditures for materials and fuel, a rise in the popularity of the railroads among the clientele and a number of other measures.

The "Round Table" meetings will also examine the problems of heavy-load traffic. Professor Yu.V. Dyakov (Moscow Institute of Railroad Transport Engineers) will evaluate the experience of the Soviet and foreign railroads on driving heavy-load trains and the effect of this operational system on the entire organization of the transport process.

G.S. De Marchi (Buenos Aires), president of the Pan-American Railway Congress Association (PARCA), will report on the role of the governments in improving the railroad operations of the developing countries. PARCA is ready to give consultative and practical help through groups of experts, similar to the European experts, on harmonious establishment and progress of railroads in various countries.

At present, in a number of regions and groups of countries, the proportion of railroad transport in the transport shipping work at times reaches 80 and even 90 percent. On the other hand, the regions that are technically more advanced, for example, the European continent, are characterized by a reduction in the proportion of railroad transport and the growth of motor vehicle transport. Opposing this trend are the major projects specified for the further development of railroad transport in various countries of the world, and the purposeful measures in the sphere of equipment, economics and railroad management.

This is the preliminary program of the coming discussion of the most important scientific-technical and economic problems, making up the 25th IRCA Congress. It is distinguished by the broad representation of scientists and specialists, the creative approach to solving complex transport problems and the interest in developing and heightening the role of railroads in today's society. The next forum of the railroad workers of the earth will be an important landmark on the road to accelerating scientific-technical progress and increasing the effectiveness and role of railroad transport in world communications.

International Achievement Review

18290186h Moscow ZHELEZNODOROZHNYY TRANSPORT in Russian No 4, Apr 89 pp 42-47

[Article by I.V. Kharlanovich, chief of the Main Scientific-Technical Administration of the Ministry of Railways, member of the organizing committee, chairman of the Scientific-Technical Center of the International Exhibition, "Railroad Transport-89," candidate in Technical Sciences]

[Text] The 4th International Exhibition, "Railroad Transport-89," was coordinated with the holding of the 25th IRCA Congress in Moscow. It will be held at the same site as in the three preceding years—at the Experimental Ring of the VNIIZht [All-Union Scientific Research Institute of Railroad Transport], near the Shcherbinka Station (Kursk direction), 40 km from Moscow, from 24 May to 2 July.

The exhibition is organized by the All-Union Ekspotsentr Association of the USSR Trade-Industrial Palace, the VDNKh [Exhibition of USSR National Economic Achievements] and the USSR Ministry of Railways.

The holding of the railroad exhibitions began in 1971, with the "Rolling Stock-71" exhibition. At that time, however, its thematic content was considerably broader than its title indicated. Along with rolling stock (locomotives and cars) were shown track-laying machines, devices for electric supply for electric railroads, signalization, centralization and automatic blocking, rail testing devices, etc. The successful presentation of the "Rolling Stock-71" exhibition was convincing confirmation of the expedience of holding such exhibitions.

Six years later, many specialists in railroad transport and transport machine building throughout the world again met at the Experimental Ring of the VNIIZhT at Shcherbinka, where the second international specialized exhibition, "Railroad Transport-77" was held. The main purpose of the exhibition was to acquaint engineering-technical workers, scientists and railroad transport and industrial production workers with the latest achievements in transport equipment on a broad scale, and to establish direct contacts between Soviet specialists and foreign business circles. The subject matter of the exhibition encompassed practically all sectors of the railroad and transport machine building economy. It is noteworthy that the exhibition took place in the year of the 60th Anniversary of the Great October Socialist Revolution and was a unique review of the achievements of Soviet railroads and transport machine building, the criterion for evaluating the level of domestic equipment.

Some 160 foreign firms and 18 countries took part in the "Railroad Transport-77" Exhibition. The Soviet exposition was a major one, about 120 enterprises, scientific-research and planning-design organizations and educational institutes from 50 cities in the Soviet Union took part in it.

In the work period of the exhibition, a symposium of Soviet and foreign specialists and scientists was held. Some 65 reports were heard, including six reports by specialists from the USSR and 59 reports by representatives of the GDR, Polish People's Republic, CSSR, Austria, Great Britain, Italy, Canada, the United States, France, Sweden and Japan. The reports were devoted to the most urgent problems of railroad transport operations: improving the locomotive and car fleet, complete mechanization of repair operations for the rolling stock and track, increasing the reliability of means of transport, organizing high-speed train service, and widescale use of electronic computers.

During the two-week period of the "Railroad Transport-77," over 250,000 persons visited its stands, including about 100,000 specialists from Soviet and foreign railroads and industry. Quite a few officials visited the exhibition: V. Tsanov, minister of Transport of the Hungarian People's Republic, K. Mishev, deputy minister of Transport of the People's Republic of Bulgaria, the delegation of the GDR Ministry of Transport, headed by O. Arndt, the delegation of the Republic of Cuba headed by minister A. Lusson Batle, S. Batkovski, acting chairman of the OSZhD Committee, Saarto Veikko, Finnish Minister of Transport, L. Oroszvari, deputy general director of the Administration of Railroads of the Ministry of Transport and Communications of the Hungarian People's Republic, the CSSR delegation, headed by Ya. Filinski, deputy minister of Transport, Ya. Kaminski, deputy minister of Railways of the Polish People's Republic, the delegation of the Socialist Republic of Romania, headed by G. Tanase, general director of the Association for Rolling Stock Repair, as well as the presidents and directors of a number of foreign firms.

During the exhibition, a number of its participants were presented with awards. For example, 97 enterprises and organizations—participants in the Soviet exposition—were awarded honorary certificates. Some 65 foreign firms and organizations were awarded honorary certificates, among them enterprises of the GDR, CSSR, Polish People's Republic, Hungarian People's Republic, Finland and the SKF (Sweden), Hegenscheidt (FRG), Ibex (United States), Hoesch (FRG), CSEE (France) firms, and others.

The "Railroad Transport-77" exhibition had great influence on the development and reinforcement of international contacts in the field of railroad equipment. The initiative of the Soviet Union in holding this exhibition was given high praise by its foreign participants. In the process, the achievements of Soviet railroad transport and transport machine building were noted, as well as their high level of development.

The third international exhibition, "Railroad Transport-86," was held in July 1986 at the Experimental Ring of the VNIIZhT at the Shcherbinka Station of the Moscow suburb. The main goals were the development and reinforcement, on a mutually advantageous basis, of

scientific-technical and economic ties between the railroads and firms of other world countries, as well as cooperation within the framework of international transport organizations.

The Soviet exhibit at the exhibition was the most remarkable. It showed the state and perspectives for development of all sectors of railroad activity in the light of accelerating scientific-technical progress. Most notable among the other exhibits were the examples of new rolling stock. Over 200 foreign firms from 20 countries were represented

Over 100 specialists spoke at the symposium, in which about 2500 persons participated. Over 200,000 persons visited the third exhibition.

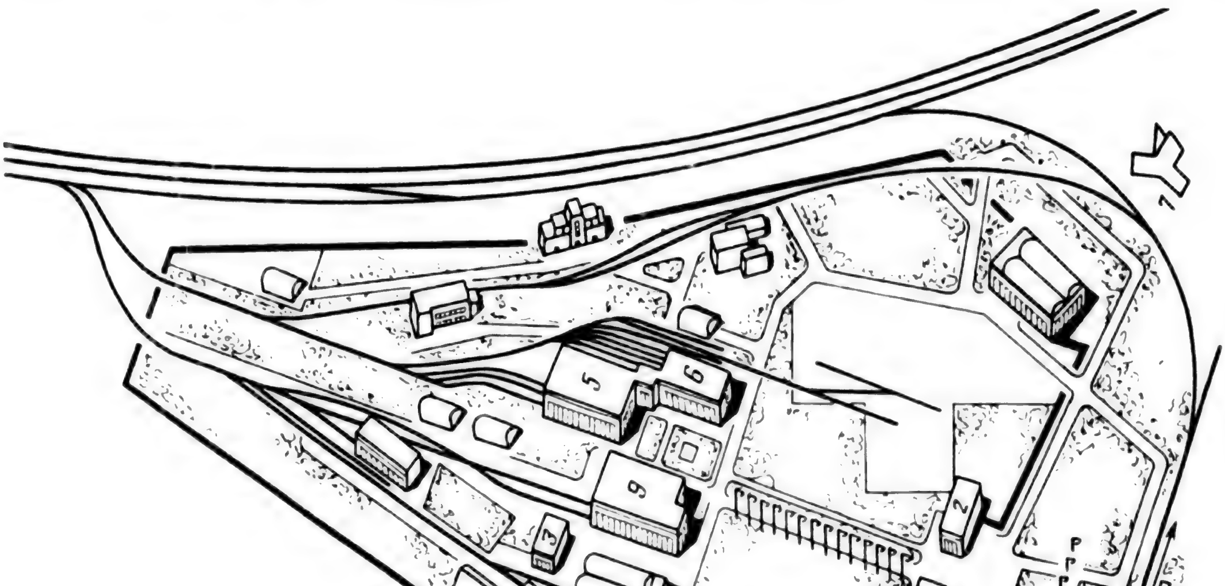
The foreign trade associations Energomasheksport, Tekhmasheksport, Mashinoeksport, Mashpriborintorg, Litsenzintorg and Vneshtorgreklam displayed commercial work at the exhibition. Contracts worth over 900 million rubles were concluded during the exhibition.

Familiarity with the numerous exhibits, participation in the scientific-technical symposiums, and the broad exchange of opinions permitted Soviet and foreign specialists to obtain a great deal of information on the innovations of the scientific-technical achievements on both USSR railroad transport and that of other countries, which contributed to the further effective development of railroad equipment.

The fourth international exhibition, "Railroad Transport-89," will be a major review of the newest equipment and technology of Soviet railroads and many foreign countries. While the preceding exhibitions were held after six and nine years, the fourth exhibition will demonstrate the achievements of science and technology for the last three years.

During these years USSR railroads have carried out a great deal of restructuring, have put into operation 1653 km of new lines, 2008 km of second tracks, have electrified 4445 km of railroad, constructed 5216 km of automatic blocking and dispatcher centralization and 8389 km of mainline cable communications. A large number of new stations and transport enterprises have been put into operation. Using accelerated methods, advanced new transport technology, based on automation, has been introduced on the railroads, as well as new equipment.

ASUSS and Ekspress-2 systems, automation and mechanized humps are widely distributed on the railroad network, and the first section of ASUOP [automated operations control system for production] has been put into



Schematic Map of the Exhibition Complex at the Shcherbinka Station

Key:
1—Soviet section of the exhibition
2, 3, 4, 5, 6—Exhibits of foreign firms
7—Site of press-conferences and symposiums
8—Management of the exhibition and commercial center
9, 10—Display outside the exhibition: track test division and pile-driving division

operation on all the roads. There has been widescale dissemination on the railroads of the experience of the Belorussian Mainline, which made it possible, through intensive introduction of new equipment and advanced experience, elimination of a number of work places and combining occupations, to release over 300,000 workers and employees and to reduce the ministry staff by 40 percent.

All of this, combined with freight transports increased by 142 million tons and passenger turnover increased by 39.6 billion passenger-km, made it possible to raise labor productivity by 19.5 percent.

In the three years of the five-year plan, the sector fully settled with the state for all types of payments, put over 1 billion rubles into the state coffers to pay off loans and obtained an above-plan profit of 1128 million rubles. This money was directed primarily toward social development of the enterprises, the material security fund and toward renovation and modernization.

The exhibition will take place in an important period, when new political thinking is being established in the world, and the USSR is activating the process of restructuring. This creates favorable conditions for developing mutually advantageous relations between states and for cooperation in science and technology. There is no doubt that all this is having a positive effect on the scale and representative nature of the exhibition, which will give new impetus to introducing intensive technology and accelerating scientific-technical progress, and to developing existing business contacts and setting up new ones.

The exhibition will be of particular interest for Soviet scientists and specialists because of the development of the Program for Technical Reequipment and Modernization of USSR Railroad Transport in 1991-2000.

What are the characteristic features of the coming exhibition? Intensive technology will be widely presented here for the first time. This is—the formation and splitting up of trains at shunting stations, control of the movement of heavy-load and long-consist trains, operation of major transport centers in interaction with other types of transport, driving heavy-load and combined trains, operating centers of technical service for cars and locomotives and repair of technical devices.

Modern locomotives and cars will be shown, including high-speed transport, based on contact-free movement of the underframes on magnetic suspension, with tractive line electric motors, transport equipment with magnetic suspension, cars for high-speed trains with pneumatic suspension and devices to tilt the car bodies on curves with a small radius.

Technological equipment and apparatus for repair, tests and operational service of locomotives, cars and multiple-unit trains, new instruments and diagnostic systems of critical assemblies and parts will have a place.

Various track structures will be exhibited, including structures for the upper track structure, reinforced concrete and long-line concrete cross ties and block foundations, switch assemblies and rail braces for high-speed lines, machines, mechanisms and equipment to construct, repair and maintain tracks.

Equipment and devices for power supply can be seen at the stands; systems and instruments for automation, remote control and communications, computer equipment, including automated control systems for railroad units, using electronic computers of the third and fourth generations, apparatus for automated control of specific technological processes on railroads, electronic computers for diagnostics, study of the dynamics and strength of locomotives, cars, their assemblies and parts, with tape-recording of the processes studied.

Wide-scale presentation is outlined of equipment for passenger facilities, containing automated systems for ticket-office operations and keeping records of seats for long-distance trains, automats and machines to sell tickets on suburban and long-distance trains, automated systems to prepare and sell commuter tickets and integrate the processing of statistical and financial accounting, and devices to mechanize and automate operations to store and transport baggage.

The possibilities of mechanizing and automating freight operations will be shown, including processing those for large containers.

Technical devices for subways and industrial railroad transport will have their place.

A large section of the exhibition will be devoted to exhibits of automated work places.

A separate section of the exhibition is devoted to scientific-technical literature and information on railroad transport, which will make it possible for the visitors to the exhibition to become familiar with the systems and types of data-base organization and support and information publications on railroad transport, patent information and studies in the field of scientific-technical information.

The Soviet exposition will by represented by 290 full-scale exhibits, manufactured by enterprises of USSR industry and railroad transport, and a large amount of technical literature.

The attention of exhibition visitors will be drawn by the railroad automated dispatcher center controlling the train traffic, which will make it possible to concentrate control of the train traffic and regulation of the car flows at one center and combine the functions of two previously existing controls—train dispatcher of the road division and road dispatcher. The existence at the dispatcher center of a unified diagram of the section, reflecting the train position, will make it possible to eliminate duplication and reduce conversations between

train dispatchers, duty attendants at the stations and other workers related to train traffic.

The automated control system for the technical service points of the car, making it possible to accelerate and improve the quality of car repair in the time period established for the stay of the consist at the PTO [technical service point], improve the preparation of trains for the run, eliminate uncoupling cars with defects from the formed consists and ensure the safety of the train traffic, will be interesting.

The powerful new mainline freight locomotives will have an important place in the exhibition. Among them is the VL85 two-section electric locomotive, on alternating current with an hourly power of 10,000 kw. In the future, after improved tractive motors are installed, the power will reach 11,400 kw. The maximum speed of the electric locomotive is 110 km/hr, and the axle load is 25 tons. The electric locomotive is calculated for work on a multi-unit system. The cab, with intensified thermal- and sound insulation, is equipped with air conditioners and heating. The VL15 electric locomotive—12-axle and two-section, with a power of 9000 kw—is designed to operate on lines electrified with 3 kV direct current. Its underframe section is standardized with 12-axle alternating current electric locomotives. The use of powerful 12-axle electric locomotives creates a basis for increasing the train weight by a factor of 1.5. There are mainline diesel locomotives, 2TE126 with 2 X 4400 h.p. and TE127, with 2400 h.p. (export variant), as well as a number of shunting locomotives, among which is the ecologically pure diesel locomotive, operating on gas fuel

New domestically produced cars will be widely represented at the exhibition. This is the 8-axle standardized gondola with a freight capacity of 130 tons, model 12-124, size T_{pr}, with blank end walls and hatches in the floor, making it possible to increase the weight of the trains and the carrying and throughput capacity of the railroads. The 8-axle tank car, model 15-1500, with increased available storage of the tank barrel of up to 156.25 cubic meters and a load-carrying capacity of 125 tons, is designed to transport light petroleum products. Its tare weight is 51 tons, and the inner diameter of the tank barrel is 3.2 meters. It is rated for a maximum speed of 120 km/hr. The tank barrel of the tank car is filled through two hatches, covered by caps. An indicator of the maximum level for filling the tank barrel and the seal actuator of the overflow device are located in the hatch. Next to the hatches are two safety valves, adjusted to a gauge pressure of 1.5 kg/cm^2. The new structure of the 4-axle gondola is model 12-757, using an increased overall dimension of 1-VM, with a 25-ton load on the axle at the rails. The load-carrying capacity of this gondola has been increased by 6 tons and will reach 75 tons. This car has expanded end door apertures, which will considerably improve the conditions for loading wheeled equipment and long loads. There is a five-car refrigerator section, type RS-5 (model 16-3000 PO of the Bryansk Machine Building Plant), with a microprocessor control system, with reinforced bogies with a permissible axle load of 23 tons and increased load-carrying capacity of the section of from 184 to 188 tons, and with new absorbing equipment for increased power-intensiveness, making it possible to increase the permissible speed of a collision from 8 to 11-12 km/hr. Also to be shown are gondolas to transport friable goods and metal, an enclosed car to transport cattle, tank-cars to transport light petroleum products, pulverized freight, nitric acid and caprolactam, an automated car with a liquid nitrogen cooling system, etc. The passenger fleet will be represented by a completely metal noncompartmented car made of nickel-free stainless steel.

Specialists on track facilities will also be able to get acquainted with the varied arsenal of track machines mechanisms and devices for laying, repairing, maintaining and cleaning snow off railroad tracks. Shown here will be: the VPO-3000 surfacing-tamping-finishing machine of the Tula Railroad Machine Building Plant, which has a working speed: up to 15 km/hr—when dispensing ballast, up to 5 km/hr—when raising the rail-sleeper-rodding and up to 2 km/hr—in ballast compaction. A diesel-generator assembly with 200 kw power is installed on the machine, supplying the electric motors of the working elements and electromagnets with alternating current, a machine moved by the locomotive. The ROM-3 machine cleans dirt from the rails and braces and also removes weeds from under the rail foot. It is used in conjunction with a tank, filled with water, in routine maintenance of the track and can remove mud up to 30 mm thick. The productivity of the machine is 3 km/hr, the water consumption per meter of track is 10 liters. The weight of the machine without the tank is 36 tons. The PMG-1 machine is for releasing, lubrication and tightening the nuts of the rail clip and T-headed bolts in routine track maintenance. Its productivity is 800 m/hr, and its weight is 36 tons. Self-powered track machines make it possible to mechanize practically all the track repair work. During the exhibition, major track repair will be done on a test ring by means of a set of track machines, that is, the intensive technology of capital repair of track will be demonstrated.

New systems of automation, remote control and computer equipment to control the transport process will be widely presented at the exhibition. They will include the system of dispatcher centralization on Don microprocessors, which have increased reliability with a sharp reduction in size and metal-intensiveness. Work on installing the systems is being simplified and its functional potentials are being expanded.

Of great interest will be a new system of automatic blocking with track circuits of 25 Hz and centralized location of the equipment (USAB-Ts), electrical centralization with an industrial installation system, a configuration of tower hump devices and a system for automatic locomotive signalization with increased interference-protection and a new system of digits (ALS-YeN). All of these exhibits represent a unified circuit of a highly reliable and safe automation system, making it possible

to carry out intensive technology for transport with a between-train movement interval of 5-6 minutes between trains, with the length of the train up to 100 four-axle cars and speeds of 90-140 km/hr.

The exhibition will demonstrate a new railroad radio communications system, the Transport, the special feature of which lies in the fact that all workers involved in the movement of the trains, beginning with the track installer, the contact network up to the maintenance men and car inspectors, who have radio communications with the work supervisor can, if necessary, communicate with the direct supervisor of the train traffic organization (station duty attendants, train dispatcher, etc.).

Also of interest is the automated integrated control system for the technical state of the rolling stock in the course of the trip, making it possible to monitor critical units of rolling stock, a defect in which could threaten the safety of the movement.

The multi-lateral cooperation of the USSR Ministry of Railways with foreign organizations, industrial firms and railroads is being developed and strengthened. Today this cooperation is implemented along the line of organizations such as the Committee for Internal Transport of the European Economic Commission of the United Nations, the Economic and Social Commission of the United Nations for the Countries of Asia and the Pacific Ocean, the International Railway Congress Association (IRCA), the International Union of Public Transport (International Committee for Subways), the European Conference on Schedules for Passenger Trains (ECPR), the European Conference on Passenger Rates (EPC) and the Pan-American Association of Railroad Congresses (PARCA).

Soviet railroads are actively collaborating on a multilateral basis with the railroads of the socialist countries within the framework of the Permanent Commission of CEMA, the Organization of Railroad Cooperation (OSZhD), the Common Fleet of Cars (OPV) and other organizations.

With a view to clear-cut interaction of the railroads of the socialist countries, long-term and on-line transport plans are being coordinated, regulative measures for throughput of car flows at border stations are being implemented and the problems of increasing the throughput capacity of border crossings and stations are being solved.

An example of a solution to one of these problems is the construction and operation of the Ilichevsk (USSR)-Varna (People's Republic of Bulgaria) and Klaipeda (USSR)-Mukran (GDR) ferry crossings.

The specialization and cooperation of railroad rolling stock production and other means of transport is widespread. For example, the CSSR is supplying the Soviet Union with mainline passenger electric locomotives and diesel shunting locomotives, the GDR—passenger cars and refrigerator cars, the Polish People's Republic and the Socialist Republic of Romania—freight cars.

The Soviet Union, in turn, is supplying the countries of the socialist commonwealth with mainline diesel locomotives, car retarders, automatic blocking and connection devices, switch assemblies, wheel pairs and track instruments. The first steps are being taken toward creating joint enterprises.

The Soviet railroads, in conjunction with the railroads of the People's Republic of Bulgaria, the Hungarian People's Republic, the GDR, the Polish People's Republic, the Socialist Republic of Romania, the CSSR and the Socialist Federated Republic of Yugoslavia on a bilateral basis, as well as within the framework of the OSZhD, are doing planning-design and research work directed toward solving urgent technical, operational and economic problems.

Soviet and Bulgarian specialists have developed a car bogie with adjustable wheel pairs, which are passing operations tests for five-car refrigerator sections, completing runs across the Ilichevsk-Varna ferry crossing and will be presented at the exhibition.

A bogie with adjustable wheel pairs for passenger cars is being developed. In the future it is proposed for use in service of the railroads of the OSZhD and the MSZhD [International Union of Railways].

Soviet railroads are taking an active part in the continuing work on improving the Unified Container Transport System (KTS) of the CEMA member countries for internal and international service. At present the transport of large-tonnage containers across USSR territory from Europe to Japan and in the opposite direction is being successfully carried out. The expansion of international container transport makes it possible to obtain a greater economic effect through accelerating the delivery and increasing the state of preservation of the freight.

The mutually advantageous multiplanar cooperation of Soviet railroads with Finnish railroads and firms is an example of the cooperation of Soviet railroads with firms of capitalist states. The parties are collaborating successfully in the sphere of building locomotives and cars and constructing railroad transport enterprises. Agreements have been reached on joint construction of a hotel complex in Leningrad, with a view to developing railroad tourism.

Soviet railroads are cooperating with firms of other capitalist states. An agreement has been reached with Australian firms on collaboration in the use of ecologically pure technology for treating ties, with Spanish firms—on collaboration in the sphere of track facilities and opening direct Moscow-Madrid passenger service, and with the British—on working out a plan for automated train traffic control on the Moscow-Klin section. An agreement has been reached with FRG firms on cooperating on problems such as working out modern

systems of automation, remote control and communications and increasing the amounts of freight and passenger transport. The question of creating joint enterprises is in the developmental stage.

Soviet railroads presently have agreements on passenger and baggage transport with 27 states in Europe and Asia. SZhD sleeping cars are running 76 direct passenger services, the total extent of which is 190,000 km. These routes, passing through the territories of countries with a different state structure, are one of the numerous evidences of mutually advantageous cooperation.

The delegates of the 25th IRCA Congress plan to visit the exhibition on 25 May.

International exhibitions are one of the important forms of scientific-technical and economic cooperation of world railroads. This is in full measure also true of the international "Railroad Transport-89" exhibition organized in our country. I can say with certainty that it will be an important event and will serve the matter of further expansion of mutually advantageous business ties.

Railroad Cars from the GDR at Shcherbinka

18290186i Moscow ZHELEZNODOROZHNYY TRANSPORT in Russian No 4, Apr 89 pp 48-49

[Article by Gunter Krug and Astrid Sommerfeld]

[Text] In February 1989, a concept of the economic and scientific-technical cooperation between the GDR and the USSR in the period up to the year 2000 was signed. This long-term document is an important practical step in increasing the efficiency of national production and accelerating scientific-technical progress. At the same time, coordination of the national economic plans during the perioa from 1991-1995 was discussed.

The Soviet Union is our major trade partner, with a share of about 40 percent in the GDR foreign trade volume. One-third of these supplies are carried out by the Ministry of Heavy Machine Building and Complete Units, which includes the rolling stock industry of the GDR. The importance of the railroad rolling stock industry for joint trade will be convincingly demonstrated at the fourth International Exhibition, "Railroad Transport-89," which will be held from 23 May to 2 June.

Taken into consideration in organizing the exposition at Shcherbinka was the experience of the major exhibition of the GDR in Moscow in 1988. All the measures which GDR industry is adopting to produce items on the level of the best world models will be shown at Shcherbinka. At the same time, the results of the joint developments within the cooperation framework will be presented.

Using the example of the bogie type GP 200, which is at the same time the dominant feature, near the entrance to the GDR exposition, the successful cooperation of the CEMA member countries, oriented toward the future, is shown. The bogie is equipped with wheel pairs with a lighter-weight structure.

The shaping of the exposition shows how rapidly new developments in design and technology based on the use of modern, highly efficient electronics are introduced into production. Sketches of the development, design and model, as well as full-size electronic exhibits, will be shown as a graphic example.

The section for a collective exhibition of the GDR-Scheinenfahrzeugbau Combine is very important. In addition to it, products of the Combine Lokomotivbau-Electrotekhnische Werke imeni Hans Beimler, Hennigsdorf, the TAKRAF Combine, enterprises of the Ministry of Electrical Equipment and Electronics and Transportkonsult International Berlin will be shown. Just as at the 1986 exhibition, GDR exhibits will be located both in a pavilion and in open areas.

Five major full-scale exhibits will be shown at the open areas: the long-distance passenger car type WPX, with improved technical indicators—used as an interesting variant for international tourism; the long-distance passenger car demonstrating the fulfillment of extensive measures for fire protection (protection in the sphere of electrical equipment, designs using combustible-resistant materials); a "sandwich"-type thermos car; a medium-sized car for a four section electric train, "Intercity" DE-1S 2000 N OZE; a rotary EDK 500 railroad crane.

The Scheinenfahrtseugbau Combine is well known to Soviet passengers and railroad workers in connection with its supplies of cars for four dozen years. A total of about 80,000 units of railroad rolling stock have been obtained by Soviet railroads from GDR enterprises, and over 31,000 passenger cars were supplied to the USSR by the specialized enterprises of the Combine. The long-distance passenger cars with air-conditioning units, or with forced ventilation, type 47, for internal and international service, dining cars, comfortable sleeping cars for international service, special-use cars, service cars and passenger cars for the Leningrad-Helsinki service have all proven themselves well in operation and under various climatic conditions.

The Ammendorf National Railroad Car Building Enterprise, which has been supplying passenger cars since 1948, was among the first to manufacture cars for the USSR. It specialized purposefully in the production of cars for a 1520 mm track gauge. The production of the enterprise is characterized by good quality, expedient equipment, good heat-insulation and constantly improved fire protection. The safe systems for power supply, heating, air conditioning, and ventilation establish the high degree of comfort required for long-distance trains. The car undergoes thorough tests before it is

released from the plant tracks and obtains quality approval from the acceptors of the GDR and USSR.

The continuity of product improvement in accordance with the purchaser's demands is clearly shown by the example of the WPW 47 K/kiz long-distance passenger car. This car—displayed at the exhibition—is an object of a demonstration of fire-proofing measures achieved in series production. These measures, and there are 40 of them, show the visitors to the exhibition that safety and reliability determine the work goals of the car building workers of GDR industries. Among these measures may be noted the following. The fire-retardant structures of the partitions between the compartments, the walls of the corridor and doors, correspond under testing to the fire-resistance of the normal fire curve of the USSR registry. All electric wires are laid only in steel pipes or in metal cable conduits. There is aluminum foil between the lining of the side wall and the insulation. The insulation lining in the ceiling is galvanized steel sheeting. The partitions for the frames of the side walls and ceilings are given a final treatment. Installation of a central distributing cupboard with ventilation in the ceiling. The wooden parts are thoroughly impregnated with a fire-proofing substance. In addition, a fire-alarm system is installed in the car. Sensors placed in the passenger compartment and galley division react to smoke and a rise in temperature, and signals from them are received at the central post in the service compartment. Work is done jointly with the subsuppliers to improve the fire-proofing indicators of the materials used.

The new long-distance passenger cars type WPX, the series production of which should be commenced in 1991, realize the concept of a development which goes far beyond the new millenniums. The foundations were laid by the 30th session of the Intergovernment Commission of the GDR and the USSR. The Ammendorf car builders, together with the workers of the Combine, are working creatively on solving this problem. Five new types of long-distance passenger cars will be constructed, including new sleeping cars. These cars are about 27 m .ers long, which provides many economic and technical-operative advantages.

At the GDR exhibition in Moscow in 1988, the new WPX 1-class long-distance passenger car was exhibited for the first time to the Soviet public (important technical data: 9 four-place compartments, 1 double compartment, 1 service compartment, 1 compartment for the conductor to rest, a powerful air-conditioning unit, automatic water heating, a power supply unit of 32 kw, an automatic coupling length of 27,430 mm, and the maximum working temperature of the car from -60°C to +50°C). It has aroused great interest and recognition, but numerous proposals have been made. These proposals, the experience of the operating tests and other considerations led to the exhibit of the WPX. The car has 5 compartments, 1 passenger facility without compartments (the salon), designed for relaxation and communication, and 1 subcompartment converted into a shower stall. This planning ensures comfortable traveling. The former two-space compartment is devoted to service, which considerably improves the work conditions for the conductor. In the opinion of the designers of the car-building industry of the GDR, the presentation of this car should show the potentials for using modern interior equipment.

The design of the rolling stock indicates: optimal planning decisions; esthetic form with respect to graphics and color; an aerodynamic shape; well-thought-out internal formation to improve comfort on the basis of functional and ergonomic requirements, as well as the esthetic needs of the passengers. In this way the design is included in the process of preliminary research, development, planning, designing and production, and the sketches, drafts and models of the design are shown.

The product of the GDR railroad industry production program for units of the RITs type is represented by the average car for the four-section diesel-electric-train, DE-1S 2000 N-OZE, for the railroads of Greece. This comfortable medium-sized car is manufactured and presented at the exhibition by the car-builders of the Bauttsen Enterprise. The DE-1S 2000 N-OZE train consists of one class-2 tractive unit, one medium-sized first class car with a galley and snack-bar (this is the exhibit), one medium-sized second-class car and one class-2 tractive unit. The train is produced and operated within the framework of an agreement of the consortium of the GDR foreign-trade enterprise Scheinenfahrtseug, the AEG-Westinghouse, LEW Hennigsdorf and the Bauttsen Car-Building Enterprise. It is estimated for a maximum speed of 160 km/hr. The body of the car is like a pipe with torsional strength, with recesses for the entrance doors, end doors and in the ceiling for the air conditioning unit. The GP 200 bogie is a trolley modified for tractive power. The interior equipment meets the highest requirements. The soft individual seats with backs and folding center arm-rests guarantee a comfortable journey. The seats in first class rotate at a 180 or 360° angle. The solid baggage shelves over the windows give the impression of a wide layout. The snack-bar equipment includes a counter with a showcase, the necessary cabinets and swiveling stools. It is advisable for a well equipped galley to have a stove, grill, two refrigerators, a drinking water cooler, a boiler, a dishwasher, a warming shelf and places to store the necessary appurtenances.

The Dassau Railroad Car Building Enterprise today leads the world in export of refrigerator cars. In 1948 the first refrigerator cars for Soviet railroads arrived from the plant. The turnover of the 40,000th car was made in 1989. The first refrigerator sections for the USSR consisted of 23 cars with a load-carrying capacity of 760 tons, and after them were 12-car, and then 21-car refrigerator sections. In the 1950's, production of very economical and reliable 5-car sections was begun. During this time over 2000 5-car refrigeration sections were supplied. Now they have obtained a new diesel-unit car

with divisions for service personnel, and four refrigeration cars with a loading volume of 400 cubic meters. For medium distances and small quantities of freight, the Dassau car builders created a self-contained refrigeration car with machine cooling and a load-carrying capacity of about 40 tons. Up to 1987, over 8000 of these cars had been supplied.

The four-axle TN-4200 thermos car was developed especially for the USSR. It is designed to transport thermally prepared freight such as fruits, vegetables, meat, fish, and beverages, and can operate at temperatures from +50°C to -50°C. Its particular advantages are: high transport economy because of a low tare weight, reduced expenses for maintenance and fast, simple loading-unloading through the large doors. The "sandwich" equipment eliminates capital repair for the entire service period of the car. The car is manufactured on the block principle. The floor, side and end walls and the roof are also made according to the "sandwich" principle. The use of high-quality insulation reaches a heat transfer coefficient of $K=0.18\ W/m^2K$.

In the 1990's, the USSR will be offered new cars, including 5-car sections and self-contained cars with machine cooling in the "sandwich" structure. At the same time, the thermos-car demonstrates the high level of "sandwich" equipment of the Dassau enterprise, which now has almost two decades of experience. It is clear that the special experience of the Dassau car builders is presented as "know-how" to other interested parties. Sections of the materials, and information, textual and graphic, will be shown, and advanced equipment will be presented.

The production specialty of the Fahrtseurausrustung National Enterprise of Berlin (equipment for railroad rolling stock) will be dispersed from small special relays to complete units for energy conservation and distribution, meeting the high technical requirements and various climatic conditions within a temperature range of from +50°C to -60°C. The new production is developed in close cooperation with car-building enterprises. The production program includes: automatic contact-free power supply units; power and control distribution units; instruments for high-voltage heating of passenger cars; powerful electronic instruments; electronic regulation and control instruments.

The following electronic instruments will be shown at Shcherbinka: an electronic unit for "ORT" (a car to control the contact-wire system), type 2470 003; an electronic regulating instrument for refrigeration sections, type 2461 008; a 110 V diagnostic instrument, type 2450 112; a transformer, 24 V/220 V, 60 Hz, 1.25 kva; a transistor instrument for a preliminary 110 V circuit, with a luminaire, for the WPX program series 91; an electronic regulating instrument for the generator unit RGA 15, 48 V, for a CSSR hauling consist.

The high reliability and productivity, low expense for care and maintenance, optimum use of energy, maximum light-weight of the structure—all of this characterizes the instruments presented. With the introduction of advanced electronics, new quality was achieved. At the same time, the electronics open up broad possibilities for full or partial automation of the production processes. Therefore, the GDR car-building industry is making its contribution to the development of railroad transport, which is shown convincingly by the collective participation of the GDR in the 4th International Exhibition, "Railroad Transport-89."

International Collaboration of Soviet Railroads

18290186) Moscow ZHELEZNODOROZHNYY TRANSPORT in Russian No 4, Apr 89 pp 50-52

[Article by V.M. Sadovnikov, deputy chief of the International Railway Traffic Administration of the Ministry of Railways]

[Text] Improving the foreign economic activity of the State as a whole, and of the individual structural subdivisions of the national economy, the service sphere and enterprises of industry, transport and communications has an important place in the restructuring of the economic mechanism.

This is directed primarily toward expanding and intensifying the process of international division of labor, accelerating scientific-technical progress, increasing the quantity and raising the quality of goods and services for the Soviet people. During the period that has passed since the 27th CPSU Congress, a number of specific steps have been taken in this direction, including drawing up normative documents and government resolutions removing the many restrictions on this activity so far existing. The Ministry of Railways is also actively included in fulfilling these resolutions, by improving the forms of international relations used earlier and seeking new, more effective ones, as well as by expanding the products list of transport services and sources of currency receipts.

As we know, the traditional forms of international economic cooperation in the sphere of railroad transport include primarily freight and passenger transport in international service, implemented on the Eurasian polygon, the size of which attests to the unlimited potentials of cooperation.

Freight transport plays a priority role in Soviet railroad activity. Its greatest volume is carried out between socialist countries within the framework of the SMGS [Agreement on International Railroad Freight Traffic], which regulates the legal norms and conditions for transport, as well as the tariff agreements of the MTT and YeTT [unified transit tariff], which determine the procedure for reciprocal settlements. It should be noted that in service between European socialist countries, this

transport is fulfilled by a specially created association—the Common Fleet of Freight Cars (OPV) and the Joint Container Fleet (SPK).

In the last few years the amounts of export-import freight transport have slightly increased in the capitalist and developing countries, and possibilities are being sought to expand the products list and volume of transit freight shipped through the territory of the USSR to other countries, which is an important source of currency receipts. This work was particularly activated with the creation, at the Ministry of Railways, of the Zheldoreksport Foreign Trade Firm. At present, the development of an Association of Freight Transporters is being completed. It is based on the transport departments and organizations of the USSR. This will make it possible to increase the volume and raise the quality of transport services being offered to foreign partners.

The railroad-maritime ferry services, Ilichevsk-Varna and Klaipeda-Mukran, play an important role in accelerating international freight transport. In the last three years they have also grown. The volumes of export freight transport, for example, increased by 2.8 million tons, and of import—by 6.6 million tons. A total of 605.1 million tons of export and 267 million tons of import freight was shipped through border railroad stations and seaports during this period. During that time about 16 million tons of freight was transported along Soviet railroads in transit service. Therefore, the obligations of the Soviet party, stemming from the agreements and contracts concluded, were completely fulfilled.

This form of transport service will be considerably expanded in the coming years through increasing the throughput and carrying capacity of the Transsiberian Mainline, introducing means of automated control for freight movement along the entire route of travel in order to ensure the guaranteed shipment deadlines, etc. A number of foreign firms and transport organizations will take part in this work. At present, transit freight is mainly transported in containers. Their increase, with an average yearly growth rate of 8 percent, is constantly noted.

The demand for passenger transport in international service under the conditions of restructuring, for broad development of programs of cooperation with foreign countries in various fields and for increased exchange of delegations and tourist groups between countries has substantially increased the demand for travel on trains of the Soviet railroads.

That is precisely why, in 1988, the running of six new train services was organized—Moscow-Warsaw through Grodno, Kiev-Legnitsa, Vilnius-Warsaw-Berlin, Moscow-Prague, Moscow-Berlin, etc. The consists of a number of trains increased the number of cars in international service from 6 to 12, and some of them have been converted from seasonal to year-round service.

This year new trains were put into circulation with the following service—Leningrad, Sofia, Moscow-Berlin, Moscow-Chop-Uzhgorod, Kiev-Berlin (twice a week), Kiev-Budapest and Moscow-Budapest (once a week), Kiev-Helm, Kobel-Zelena Gura. The Moscow-Beijing train will now run up to twice a week. In the last three years, passenger transports between the USSR and Bulgaria increased by 20.4 percent, with the Hungarian People's Republic—by 96, with the GDR—by 19.1, with the PRC—by 98.4, with the CSSR—by 5.2, with the Socialist Federated Republic of Yugoslavia—by 92.8 percent, and with the Polish People's Republic—almost double.

Every year passenger transport volumes with other countries increase, particularly with Finland, the FRG and Italy. This is in many ways furthered by the considerable expansion in the last one or two years of the services for passengers, the introduction of a more flexible rate policy and the practice of charter tourist trains for special purposes. Highly rated, for example, is the special tourist train, organized last year, the "Orient Express", along the route, Hamburg-Berlin-Warsaw-Moscow-Beijing. We realize, however, that our achievements in transport service for tourists is still very modest. Therefore, we are striving to develop international cooperation in this sphere, in the most varied forms. The Soviet railroad trains have a solid basis for this, for after all, they carry out regular passenger transport in 27 countries of Europe and Asia, each of which has accumulated a wealth of experience in this area.

Traditional forms of cooperation between Soviet railroads and their foreign partners are scientific-technical exchange and joint developments of railroad transport equipment and technology. Considerable experience has been accumulated, and there is a great potential here. The most active cooperation lies within the framework of the Organization of Railroad Cooperation of the Socialist Countries (OSZhD), the CEMA Permanent Commission on Transport, and coordinated centers for the most important transport problems. The development and intensification of collaboration obtained a new impetus after the adoption by the CEMA member countries of the Comprehensive Program for Scientific-Technical Cooperation and the transition to a programmed-purposeful method of studying priority problems in the OSZhD commissions, as well those related to the development of direct production ties between the related enterprises of the socialist countries. At present, over 40 contracts have been concluded between the USSR enterprises and their partners from the socialist countries, which determine the nature and conditions for interaction in the interests of the development of railroad transport.

In the last 10-15 years, the scientific-technical ties of Soviet railroads with a number of railroads, firms and organizations of capitalist countries have strengthened. Many of them are stable and mutually advantageous. Restructuring the foreign economic activity will make it possible to supplement them with new content and will give them a more dynamic nature. Here are just a few specific examples of cooperation. On the request of the

Argentine railroads, Soviet specialists are taking part in equipping the Retiro-Mercedes line with centralizing devices. Turkish railroads have asked the Ministry of Railways to have Soviet specialists participate in electrification of the mainlines of that country, with the possibility of supplying the USSR with modern rolling stock as compensation. In accordance with an agreement of 1983, scientific-technical exchange is being implemented between the Soviet and Spanish railroads on coordinated subject matter.

A broad program of scientific-technical and economic cooperation was worked out and implemented between the railroads of the USSR and the FRG, in which well known firms such as Siemens, Bayer, Knorr-Bremse, Hegenscheidt, Seba Dinatronik, UTS-System, AEG, Klockner and others are actively participating. The exchange of visits between the delegations of the two roads made it possible to outline and adopt plans for cooperation on a broad range of problems, including the creation of high-speed railroad lines, including those on magnetic suspension, automation of shunting hump processes and production of modern machine tools and equipment.

Relations with Indian railroads are developing successfully. A plan for scientific-technical and economic cooperation was coordinated. Four delegations of specialists from India became familiar with Soviet railroad experience in organizing scientific research, testing computer systems for railroad transport, organizing overhaul shop repair of rolling stock and carrying out track service.

The Hindustan Development Corporation purchased technology and equipment in the USSR to reinforce crossing switch assemblies using the blasting method. The Project and Equipment Corporation is testing, on a contractual basis, at the Experimental Ring of the VNIIZhT [All-Union Scientific Research Institute of Railroad Transport], models of railroad equipment manufactured at Indian enterprises in accordance with Soviet blueprints.

There are various aspects of cooperation between the Soviet and Finnish railroads, and between the Ministry of Railways and a number of firms and organizations in this country. There is widescale interaction in the sphere of freight and passenger transport between the two countries. Many passenger service problems on the trains of the Moscow-Helsinki line have been solved, including payment with varying currency in the dining car. In conjunction with the Haka firm, a car preparation station has been constructed at the Tosno station. The Rautaruukki firm has been manufacturing, on a cooperative basis, specialized rolling stock for Soviet railroads for a number of years.

This year the creation of two joint Soviet-Finnish ventures has been completed, in the work of one of which American specialists are also taking part. One of them is constructing a hotel in Leningrad to develop railroad tourism, and the other will be engaged in operating tank cars equipped with devices for automatic cleaning after the transport of viscous freight. Cooperation with the Nokia firm in using various means of communication is being expanded. Definite success has been achieved in the activity of the transport work groups for the Commission on Cooperation of the CEMA Member Countries and the Finnish Republic.

Cooperation with the British firm, General Electric Signal, is developing fruitfully. This firm gives technical assistance in automating train traffic on the Moscow-Kalinin section. Successful negotiations are being carried out with the Australian firm, Koppers, on using ecologically pure preservatives to impregnate wooden ties. The Ministry of Railways is also connected by many years of contacts with foreign firms such as Plasser and Theurer (Austria), Speno and Kastolin (Switzerland), CAF (Spain), Alsthom-Atlantic and Saft (France), Stromberg (Finland), Sumitomo and Komatsu (Japan) and others.

Soviet railroads are actively participating in the work of international transport organizations (in addition to those mentioned above): The Committee for Internal Transport of the European Economic Commission of the United Nations Organization, the Commission on Transport of Hazardous and Perishable Freight, the International Union of Public Transport and its Committee on Subways (MSOT), the Economic and Social Commission of the United Nations Organization for Asia and the Pacific Ocean (ESKATO UNO), the European Conferences on Passenger Train Schedules (ECPR) and on Passenger Rates (EPC) and, of course, the International Railroad Congress Association (IRCA), and the immediate one, the 25th Congress, which is now being held in Moscow.

The nature of the cooperation with international organizations and their transport organs can be judged by the example of the participation of representatives of Soviet railroads in the work of the ESKATO of the United Nations. Specialists of the Ministry of Railways regularly participate in the sessions of the Committee for Transport, Communications and Tourism, in the work of the Asian-Pacific Ocean Group for Railroad Cooperation (ATGZhD), created with their participation, and its thematic subgroups, in the Intergovernmental conferences of railroad experts, in the Coordination Group for Scientific Research, and in the periodic conferences of the ministers of the transport region, which are responsible for the development of railroads. The programs for the Decade of Development of Transport and Communications in the region of Asia and the Pacific Ocean (1985-1994) were worked out with the active assistance of Soviet railroad representatives.

The contribution made by Soviet specialists to the development and foundation of priority directions of cooperation in railroad transport is highly praised: the Master Plan for the Development of the Asian Railroad Network, the plan for creating the Transasian Railroad Network (TAZhD), organizing combined railroad-sea transport in the direction of Southeast Asia-Western

Europe, containerization of freight transport, personnel training, transmitting experience and new technology. Specific, practical, action has already been carried out in each of these directions.

In 1982 and 1988, conferences of experts from the countries of the region were held in the USSR to work out ways to carry out the projects of TAZhD and the Master Plan for the Development of the Asian Railroad Network. At these conferences, Soviet specialists came forth with scientifically substantiated proposals which laid the foundation for the unanimously adopted recommendations directed to the Secretariat of ESKATO and the railroad administrations of the region.

In accordance with the program for the Decade and upon individual requests of the Secretariat of ESKATO, Soviet scientists and leading railroad specialists did research on a broad range of railroad transport problems. In the last three years alone, over 20 of these research projects were fulfilled.

An important role in training personnel and transmitting the experience and technology accumulated and available on Soviet railroads is played by the seminar-familiarization trips of specialists from the developing countries of Southeast Asia. On the initiative of the Soviet railroads, these seminars have begun to be held regularly and are devoted to urgent problems of developing and improving railroad transport work. For example, in 1982, a seminar-familiarization trip was held in Moscow, Kiev and Donetsk on problems of railroad track service. In 1984 an analogous seminar was devoted to the problem of electrifying railroads and ways to reduce expenditures for this purpose. This seminar was held in Moscow, Rostov-on-Don, Novocherkassk, Krasnodar and Volgograd. The next seminar-familiarization trip was held in 1986, and examined the problems of urban and suburban railroad transport.

In 1988 the seminar was devoted to problems of comprehensive planning development of railroad transport. It took place in Moscow, Leningrad, Odessa, Krasnyy Liman, Slavyansk and Krasnoarmeysk.

Most of the participants in the seminar—experienced railroad specialists from 14 countries in the region (India, Iran, Pakistan, Bangladesh, Sri Lanka, Nepal, China, Vietnam, Thailand, South Korea, Malaysia, the Philippines, Indonesia and Mongolia), as well as the FRG and Japan—valued the high degree of outfitting and good organization of work on testing the models of railroad equipment at the Experimental Ring of the VNIIZhT at the Shcherbinka station. From the results of the seminar, a protocol was adopted, which devoted considerable space to the conclusions and recommendations directed to the ESKATO secretariat and the railroad administrations of the region.

The next seminar will be held in May-June 1990. Its participants, in Moscow, Sverdlovsk and Novosibirsk, will become familiar with the problems of scientific research and personnel training in railroad transport. It should be noted that, on the initiative of the Ministry of Railways, beginning in 1985, the Moscow and Leningrad institutes of railroad transport engineers introduced 35 yearly subsidies for railroad representatives of the ESKATO region. This is a serious contribution from our country toward realization of the programs of the Decade of Development of Transport and Communications.

There is another efficient form of Soviet railroad cooperation within the framework of the United Nations ESKATO. It is a matter of the tendency of Soviet experts to participate in realizing the specific projects of this organization. Last year alone, four experts carried out plans for the organization of heavy-load traffic, and studied the problems of combined railroad-sea freight transport on the routes between Southeast Asia and Western Europe, and modernization of the railroad systems on the basis of using computers. The ESKATO Secretariat highly praised the contribution of Soviet specialists to realizing these plans.

While formerly, Soviet railroads paid primary attention only to scientific-technical cooperation and rendering assistance to the developing countries of the region, under the conditions of restructuring the economic mechanism, increasing attention is given to mutually advantageous economic cooperation. A special report on this problem, from the Soviet delegation, which was valued by the foreign participants, was distributed at the 12th Session of the ESKATO Committee on Transport, Communications and Tourism.

Good perspectives for cooperation in this sphere are also opened up by the activity of the Soviet National Committee for Asian-Pacific Ocean Economic Cooperation (SNKATES), recently created in the USSR, with representatives of the Ministry of Railways and a number of railroads participating in its work. It can be said with certainty that in the next few years, scientific-technical and economic cooperation in railroad transport will be further developed.

USSR Railroad Transport in 1988

18290186k Moscow ZHELEZNODOROZHNYY TRANSPORT in Russian No 4, Apr 89 pp 53-56

[Article from materials of the Administration of Statistics of the Ministry of Railways: "USSR Railroad Transport in 1988"]

[Text] In accordance with the decisions of the 27th CPSU Congress and the 19th All-Union Party Conference, railroad transport was included in the process of restructuring the economic mechanism. Along with the existing methods of centralized management, economic forms of operation are increasingly widely used. They are directed toward intensifying the use of the production potential, reinforcing the material interest of all the

workers in achieving the end results and accelerating the solution to social problems. The sector's transition to full cost accounting and self-financing and carrying out the first stage of improving the administrative structure is particularly important in these processes.

The operational situation has become particularly stepped up in both 1988 and in the past three years of the five-year plan. The severe winter of 1987 and the events at Chernobyl, Arzamas and Sverdlovsk required tremendous efforts from the railroad workers to organize the delivery of the necessary freight for rehabilitation operations. An unusually serious situation formed at the end of the year, when the calamity in Armenia required that everything be subordinated to the increasingly rapid elimination of the consequences of the earthquake, transporting the people and organizing efficient deliveries of primarily needed freight to the areas of the catastrophe. Despite this, railroad transport has mainly coped with the obligations entrusted it to ensure freight and passenger transport, retaining the status of the leading form of transport. Its share in the country's overall transport system is about 67 percent of the freight turnover and over 46 percent of the passenger turnover.

In 1986-1988, for accelerated development of industry and agriculture, railroad transport carried over 140 million tons of national economic freight above the plan, which is equivalent to 13 days work of the entire network, or the yearly volume of the shipments of the Far East, Transbaykal and Baykal-Amur roads taken together. As a result, quite good economic results were obtained. The labor productivity of the workers engaged in transport rose by 19.5 percent, with the goal 6.9 percent and on the whole for the five-year plan by 12 percent, and 1 billion 164 million rubles of above-plan profit was obtained, of which over 450 million rubles were for last year.

The past three years of the five-year plan are characterized by substantial advancement in solving the sector's social and financial problems. The wages for transport during this period rose by 48 rubles and exceeded 263 rubles, which exceeds their level in the national economy as a whole by approximately 24 rubles. These results were achieved through introducing the Belorussian method and introducing new wage rates and salaries. The volume of housing construction with respect to the overall area of apartment houses put into operation increased in 1988 by up to 2.1 million square meters (in the 11th Five-Year Plan the average yearly volume of housing introduction was 1.85 million square meters).

High growth rates are being maintained in passenger transport, which made it possible last year to exceed the passenger turnover level established in the last year of this five-year plan by almost 12 billion passenger kilometers. At the same time, according to the evaluation of USSR Gosplan, this level does not provide for the population's demands for transport in the summer period.

The volume of freight transport in 1988 was 1.3 percent lower than the goals of the five-year plan. A drop was noted in fulfillment of the assignments of the five-year plan for development of the sector's material-technical base. In the past years, 227 kilometers of new lines have not been introduced for railroad transport, 195 kilometers have not been electrified, 647 mainline electric locomotives and 250 diesel locomotives, and about 44,000 freight and 932 passenger cars have not been received. All of this complicates stable work on ensuring freight and passenger transport and requires a search for additional reserves.

Since the beginning of the five-year plan, the volume of transport for industrial railroad transport has risen by 21.5 percent, and for loading-unloading operations—by 10.6 percent. The production of industrial goods at transport enterprises has increased by 10.8 percent during the years of the five-year plan, but despite this many enterprises are not fulfilling the contractual obligations.

The load of the construction subdivisions of the Ministry of Railways in the last three years has risen by 39 percent, or by 190 million rubles. Passenger transport on the country's subways has risen and the losses for basic activity have been reduced by 15 million rubles.

The dissimilar contribution of the sector's subdivisions to the overall total of plans fulfilled for the five-year plan must be noted. For example, every year the Transcaucasus Railroad fails to cope with the transport plan, and 18 roads are not ensuring the assignments of the five-year plan for transport. Many enterprises are permitting serious financial omissions.

Freight and Passenger Transport

Of the total volume of above-plan freight shipments achieved in the three years of the five-year plan, over 62 million tons, or 44 percent, was obtained in 1988 when the yearly plan for shipment was completed ahead of schedule, on 25 December. As a result, the transport was 4097.3 million tons, which was 47.6 million tons or 1.2 percent more than in 1987.

Some 79 percent (over 49 million tons) of the above-plan transport falls to freight on the State order products list. The plan for hard coal and coke was overfulfilled by 23.6 million tons, for petroleum and petroleum products—by 2.7 million tons, for grain and milling products—by 14.8 million, for ferrous metals—by 6.6 million, for combined fodders—by 3.3 million tons. Out of the 17 types of freight for the State order of USSR Gosplan and the Ministry of Railways, fulfillment of the plan was not ensured for iron and manganese ore—99.7 percent, flux—97.3 percent, chemical and mineral fertilizers—98.8 percent and for timber—97.6 percent. For the last two categories, the increase for 1987 was respectively 4.7 million tons (2.9 %) and 4.6 million tons (almost 2.9 %).

with about one-third of this volume underloaded through the fault of the railroads.

Last year the transport of agricultural products was carried out more successfully. In the mass harvest period (June-September) alone, 40.1 million tons of grain, potatoes, vegetables and fruits, cotton and sugar beets were loaded, which is 1.4 million tons more than in the same period of 1987.

In the first six months of 1988, as compared with similar periods in the past years of the five-year plan, the highest level of average-daily loading was achieved—11,342,000 tons. The plan for total freight shipment was overachieved by all the roads except for the Transcaucasus, which underloaded 1.8 million tons. The greatest contribution to the overall results of the work was made by the roads which completed fulfillment of the plan ahead of schedule. They include the Belorussian Railroad, which loaded 5.3 million tons above the plan, the South Urals—4.9 million, the Sverdlovsk—4.8 million, the Oktyabr—4.6 million, Kemerovo and Krasnoyarsk—4.4 million apiece, the Southern—4.2 million, the Baltic—4.1 million, etc.

It should be noted that the plan for the products list of State orders from USSR Gosplan and the Ministry of Railways was fulfilled only by the Moscow, Southeastern and Baykal-Amur roads. The worst situation was formed on the Volga road, where, out of the 12 planned cargo loads, the fulfillment of only four of them was ensured, or by 33.3 percent, the Lvov—50 percent, the Transcaucasus—58.8 percent, the Transbaykal—61.5 percent, the Kuybyshev—64.3 percent, and the Odessa, West Kazakhstan and Far Eastern—by 66.7 percent each. The State order of USSR Gosplan was fulfilled by all the railroads except for the East Siberian (98 %) and the West Kazakhstan (95.8 %), with the first being due to an underload of timber, and the second—to chemical and mineral fertilizers, grain and milling products. The East Siberian and Krasnoyarsk railroads underfulfilled the plan for transport of timber freight by a considerable amount; for chemical fertilizers—the Sverdlovsk, Kuybyshev, Lvov, Odessa and Volga; fluxes—the Donetsk and Tselina roads; iron and manganese ore—the Dnepr Railroad. The table gives data on fulfillment of the plan for freight transport in 1988 and in comparison with 1985.

Indicators	1988				
	Fulfillment	+ or - for		% of	
		the plan	1985	the plan	1985
Freight shipped, in million tons	4097.3	+62.1	+163.2	101.5	104.1
USSR Gosplan State order freight	2424.6	+49.6	+99.0	102.1	104.3
including					
Hard coal	798.9	+21.6	+45.3	102.8	106.0
Coke	33.8	+2.0	+0.2	106.2	100.5
Petroleum and petroleum products	418.5	+2.7	-0.7	100.7	99.8
Iron and manganese ore	262.6	-0.8	+3.6	99.7	101.4
Nonferrous ore and sulfur raw material	70.6	+2.7	+3.5	103.9	105.2
Ferrous metals	211.3	+6.6	+6.5	103.2	103.2
Chemical and mineral fertilizers	163.2	-2.0	+16.7	98.8	111.4
Metal structures	5.2	+0.2	-0.4	103.4	92.6
Cement	110.4	+2.2	+6.6	102.0	106.4
Timber	160.8	-3.9	+11.5	97.6	107.7
Perishable foodstuff freight	11.7	+0.2	+0.2	101.6	101.8
Grain and milling products	149.8	+14.8	+3.3	111.0	102.2
Combined fodder	27.8	+3.3	+2.7	113.6	110.6
Freight of the MPS State order					
including					
Paper	17.1	+1.8	+0.2	111.8	101.1
Fluxes	66.6	-1.9	-1.0	97.3	98.6
Refractory materials	29.0	+1.4	-0.5	105.0	98.1
Construction freight	868.4	+45.4	99.4	105.5	112.9
Freight for local planning, in thous. t.					
Shales	16.7	+0.2	-0.3	101.3	98.5
Ferrous metal scrap	64.1	+2.3	-3.0	103.7	95.6
Nonferrous metals	15.4	+0.5	-0.3	103.1	97.8
Chemicals and soda	88.8	+2.4	+6.5	102.8	107.9
Turf and turf products	8.8	-1.1	-2.2	89.1	80.1
Industrial raw material and molding materials	112.8	-2.6	+12.8	97.7	112.1
Granulated slag	25.0	-0.8	+1.6	96.7	106.7

Indicators	Fulfillment	1988 + or - for the plan	1988 + or - for 1985	% of the plan	% of 1985
Sugar	13.0	+0.5	+0.5	104.4	104.3
Potatoes, vegetables, fruits	12.2	+3.3	-0.6	136.3	95.0
Salt	18.1	+0.6	-1.2	103.5	94.0
Cotton	3.9	+0.8	+0.02	126.7	100.7
Sugar beats and seeds	23.4	+0.6	+0.5	102.5	102.3
Oilcakes	11.7	+1.0	+1.3	109.1	113.0
Transshipping from water transport	41.2	-1.6	-0.7	96.2	98.4
Import freight, in thous. cars	92.8	-1.7	-11.6	98.2	88.9
Machines, machine tools, engines, equipment	1121	-22	-88	98.1	92.7
Metalware	1155	+98	-27	109.1	97.7
Agricultural machines	953	-66	-88	93.6	91.5
Remaining foodstuffs	805	+98	-143	113.8	84.9
Industrial goods	1097	+17	-183	101.0	85.7
Poultry	123	+35	-17	140.0	87.9
Containerized freight	2118	+83	+371	104.1	121.1
Remaining and general cargo	4155	-796	-64	84.1	98.5

On the whole for the year, 53,220,000 tons were shipped in containers, or 102.3 percent of the plan, and 103.36 percent of the 1987 level. Of the total amount, about 21 million tons were shipped in large containers, or 101 percent of the plan, and 105.4 percent of 1987.

Last year the growth rates of the static load were somewhat slowed down. As compared with 1987 it rose by 30 kg. The planned assignment was overfulfilled by 130 kg, which made it possible, without drawing in additional stock, to fulfill transport in the amount of almost 10 million tons. The static load increased in the loading of petroleum and petroleum products, ferrous metals, cement, chemicals, soda, etc. At the same time, for most of the freight it was reduced and particularly for hard coal, milling products, shales and salt, granulated slags, sugar, etc. According to this indicator the plan was fulfilled by most of the roads, with the exception of the Oktyabr, Southwestern, Lvov, Donetsk, Tselina and Sverdlovsk. The best results were achieved by the Belorussian Railroad, where not only was the plan fulfilled, but a static load growth of 730 kg was achieved, and also by the Odessa (490 kg), Southern (370 kg), Krasnoyarsk (370 kg) and Southeastern (330 kg).

One of the decisive factors in freight resources is the unloading. For the period under review on the network the daily unloading rose by 1 percent as compared with 1987. The yearly plan for this indicator was fulfilled by 15 railroads. A number of roads, failing to cope with the unloading plan, had a considerable excess of local freight. The unloading was not performed with a smooth flow by days of the week and in the course of the day, which made the operational work more complicated. For example, in the first half of the day, only 18 percent of the planned volume was unloaded on the Azerbaijan road, West Kazakhstan and Baykal-Amur—19 percent, Transbaykal—21 percent; Moldavian, North Caucasus, Alma-Ata, Krasnoyarsk—22 percent; Odessa, Transcaucasus, Southeastern and Volga—23 percent.

The level of shipment routing was 41.9 percent and somewhat reduced on the whole for loads such as hard coal and coke, petroleum and petroleum products, fluxes, agricultural machines, motor vehicles, mineral fertilizers and timber loads. At the same time the relative proportion of the routes by designation per station was reduced by 0.5 percent. The greatest reduction in percentage of routing was permitted on the Moldavian and Donetsk (1.2), Odessa (1.5), Azerbaijan and West Siberian (1.7). East Siberian (1.3), Far Eastern (3.2) and Krasnoyarsk roads (4.4). At the same time, it increased on the Baltic, Transcaucasus, Volga, Kuybyshev, Sverdlovsk and some other roads.

In 1988 railroad transport developed a freight turnover amounting to 3925 billion km/tons, which exceeds the estimated goal and the 1987 level by 2.6 percent (100 billion). At the same time, over 60 percent of this amount was caused by the increase of 12 km in long-distance transport, which was 957 km. As compared with last year, the transport distance was increased for most of the mass freight, including by 17 km for coal, 33—for petroleum and petroleum products, 27—for fertilizers, 55—for grain and milling products and 53—for foodstuffs. At the same time the transport distance was reduced for ore, timber and paper. The increase in freight turnover was ensured by all the railroads, but the Lvov, Moldavian, Odessa, Sverdlovsk, West Siberian, Kemerovo and Krasnoyarsk roads failed to cope with the planned assignment.

Last year there was a considerable increase in transshipping for inter-road junctions, which made it possible to fulfill the year's assignment by 100.8 percent. Only in

December were its amounts lower than the preceding year (by 10,600), which to a certain extent stems from the difficulties in moving train flows because of the earthquake in Armenia. The increase in the general transfer was ensured mainly through the increase in 13,900 loaded car flows, even though their average daily transfer was less than the amounts specified by the norm. The transfer increased in the greatest amounts, and thus ensured the fulfillment of the norms, on the Oktyabr, Belorussia, Volga, Kuybyshev, West Kazakhstan and Baykal-Amur roads.

For industrial railroad transport the volume of shipments was 104.6 percent fulfilled. Over 30 million tons of above-plan freight were transported, and the increase over the preceding year was 6.1 percent, or over 39 million tons. All the associations coped with the plan for transport. The plan for volume of loading-unloading operations was fulfilled by 103.3 percent, over 13.2 million tons were processed above the plan, and the increase in volume was 1.7 percent, or 7 million tons. The Vladimir, Volgograd and Perm associations did not fulfill the plan for the year.

Last year the volume of passenger transport fulfilled rose by 35.7 million persons, as compared with 1987. The State order for passenger turnover was fulfilled by 103.2 percent and its actual value of 413.8 billion passenger-kilometers exceeded the level established by the five-year plan for 1990. State orders for passenger turnover were fulfilled by all the roads, with the exception of the Azerbaijan and Transcaucasus. The quality of passenger service, however, is still not at the proper level. The constantly growing demand of the population for transport is not in accordance with the potentials of the roads for building up passenger facilities, availability of passenger cars and keeping them in working order. The railroads are forced to operate old-fashioned cars and those that have outlived their service life, which makes it impossible to create the necessary service and comfort for the passengers.

The population density of the passenger car for long-distance service was 31.7 passengers per car, and for suburban service—41.2. It was higher than the average network for long-distance service on the Oktyabr, Baltic, Belorussia, Moscow, Southwestern, Southern, West Kazakhstan and Far East roads, and for the suburban—on 8 railroads.

In the current five-year plan the experience of the Moscow Railroad is being widely introduced in organizing the running of long-consist passenger trains, which is important not only to increase passenger transport, but also to increase the throughput and traffic capacity of the network. This made it possible, in the three years of the five-year plan, to increase the average train consist on the whole for the network to 15.7 cars, or by 2 percent, and on the Moscow road to 16.9 cars, or by 3 percent.

The level of schedule fulfillment for this period rose for passage by 0.6 percent, and for arrival by 2.9 percent. It improved, as compared with 1987, for departure on 19 roads, for passage on 25 and for arrival on 21 roads. For all these indicators the level of schedule fulfillment was raised on 15 roads, including the above-average network level achieved on the Oktyabr, Dnepr, Kuybyshev, West Kazakhstan, Tselina, South Urals and Krasnoyarsk roads. On the whole for the network the schedule for departure was fulfilled by 97 percent, for passage—by 93.6 percent and for arrival—by 86.5 percent.

In the three years of the five-year plan the country's subways transported 14 billion, 110 million persons, which is 100.2 percent of the five-year plan, and for the year's total—100.6 percent. The extent of the lines increased by 41 kilometers over 1985 and reached 485 kilometers by the end of 1988. Labor productivity rose by 8.2 percent, and the production cost was reduced by almost 2 percent. The plan for passenger transport in 1988 was 99.7 percent fulfilled. The planned assignment for passenger transport was not fulfilled on the Kiev subway because of the reduction of its share in the cost of the unified fare tickets and for the Baku because of the reduction in traffic flow stemming from the work being done to renovate the 28 Aprel Station.

The saving of operational funds was 5.5 million rubles, losses were reduced by 4.8 million rubles, and counting in the subsidiary-auxiliary activity—by 7.8 million rubles. The cost of transport per 10 passengers was reduced according to the plan by 1.5 percent. Labor productivity rose by 5.6 percent as against the plan. The established planned assignments were fulfilled in 1988 by utilization of 607.1 million rubles worth of capital investments, including 467.4 million rubles for construction-installation work and putting into operation 10.2 kilometers of new lines.

Use of Rolling Stock

On the whole for 1988 and the three preceding years of the five-year plan, favorable results were achieved for a number of indicators of the use of rolling stock: the turnaround time of the cars was accelerated, the idle times at servicing stations were reduced, the car and locomotive productivity rose, and the weight of the trains and speed of their movement increased. The established assignments proved to be underfulfilled, however. The average turnaround time per car was accelerated by 2.2 hours as compared with 1985.

The year was successfully completed, the use of cars improved and the assignment of the State order for car turnover was fulfilled by the Gorkiy, Northern, Donetsk, West Siberian and Baykal-Amur, and the South Urals, Kazakhstan and Central Asian roads, and moreover the latter, as well as the Sverdlovsk and Baykal-Amur roads, carried out the assignment specified by order of the Ministry of Railways No 36 Ts. At the same time, the Transcaucasus, Transbaykal, Azerbaijan, Southwestern, East Siberian, Kemerovo and Lvov roads were lagging behind greatly at the end of the year. On half the roads of

the network the idle times of the cars for loading operations and at the technical stations were reduced, and among them the most substantial reductions were made by the Volga, Southeastern, Donetsk and Dnepr roads.

The scientific-technical program for increasing the average weight of a freight train in the railroad network for the period from 1986-1990 is being carried out at a stepped-up rate. In 1988 the train weight was 3120 tons, which is 80 tons lower than that established by the State order, with an 87 ton increase over 1985. At the same time, it rose on all the roads , and the Krasnoyarsk, Baykal-Amur, Southeastern, Transcaucasus and Belorussian roads passed the milestone established for 1988 by the five-year plan. On the Sverdlovsk, Gorkiy, Kuybyshev, Volga, Azerbaijan, West Siberian and South Urals roads only 7-30 percent of the planned increase was mastered. As compared with 1987 the train weight rose by 35 tons, but it was reduced on the Sverdlovsk (7 t) and Azerbaijan (3 t) roads.

The change in a number of indicators of the operational work is having a negative effect on increasing the average train weight. For example, due to the increase in empty runs, 12 tons were lost, and on the South Urals, Transbaykal, Moscow, Gorkiy, Northern and Kuybyshev roads—15-31 tons. Due to the unsatisfactory work in increasing the static load, the train weight was reduced by 10-19 tons on the Southwestern, Donetsk, Tselina, and also the Transbaykal and Far Eastern roads. Shipping trains that were underweight and incomplete consists caused considerable losses in the train weight. On the whole for the network they were 12 tons, and on the Odessa, Azerbaijan, Kemerovo, Sverdlovsk and West Siberian—10-18 tons.

Improving the schedule discipline had a positive effect on accelerating the train movement. The section speed was increased by 0.5 km/hr, and on the Northern, Odessa, Southern, South Urals, Gorkiy and Tselina—by 0.9-2.1 km/hr. With electric locomotive haulage it rose by 0.4 km/hr and was 34.7 km/hr, and with diesel locomotive haulage—by 0.5 to 29.2 km/hr. The movement speed of the trains rose on 22 roads. The measures taken to increase the role of the train movement schedule made it possible to raise the level of trains proceeding on schedule by 2.4 percent as compared with 1985. On the whole for the network in 1988, 88.9 percent of the trains were sent from the formation stations on schedule, which is 0.1 percent higher than in the preceding year, with a 5.3 percent reduction in late time.

The departure schedule rose on 23 roads and was most considerable (by 2.5-4.6 %) on the North Caucasus, Volga, Odessa, Oktyabr, Kuybyshev and Baykal-Amur roads. Some 8 roads, however, permitted a reduction, and the lowest level of the schedule was on the Lvov—81.3 percent and the Sverdlovsk—74.2 percent. The passage of the freight trains on schedule and with a reduction in delay was 74.6 percent, which is 2 percent higher than the 1987 level.

Development of the Material Base

In 1988 the work on reinforcing the sector's material-technical base continued, and especially in the development and renovation of line and plant bases of technical transport means and elimination of bottle necks in the sector's development. On the whole, the limit of construction-installation work on building production and social facilities was developed, and putting secondary tracks (683 km) into operation was ensured in accordance with the State order. The program of housing-everyday construction for preschool institutions, general education schools, hospitals, polyclinics was overfulfilled and 2,038,000 square meters of total housing area were put into operation. Lagging behind was permitted in introducing new lines (69 km), electrification (107 km), centralizing switching, lengthening station tracks, building vocational-technical schools and clubs, constructed for the the Ministry of Railways by organizations of the Ministry of Transport Construction, and 16 million rubles worth of funds for construction-installation work were unutilized. Substantial lagging behind was permitted through the fault of this ministry in fulfilling the plans for re-equipping production facilities and putting into operation housing for railroad workers.

At the same time, the plan for putting apartment houses into operation by the organizations of the Ministry of Railways was 117 percent realized. Assignments for the introduction of housing were covered on the Oktyabr, Northern, Dnepr, Transcaucasus, Southeastern, Tselina, Alma-Ata, South Urals, West Siberian, East Siberian and a number of other roads. The Baltic, Moldavian, Azerbaijan, Volga and West Caucasus roads, however, disrupted this plan.

The undersupply of rolling stock by industry is causing particular alarm among railroad workers. In 1988, transport was undersupplied, according to the plan, 154 electric locomotives, 70 mainline and 28 shunting diesel locomotives, 11,600 freight cars and 151 passenger cars. Domestic plants violated contractual discipline every month last year, and the plan for the fourth quarter could be fulfilled by only 71 percent, and moreover, in December 2,565 freight cars were not supplied, or every third one of the monthly assignment. There is a similar situation with the manufacture of tank cars. In 1988 railroad transport received only 59 percent of those planned, and compared to 1986 the volume of supplies of tank cars was cut in half.

In 1988 an unsatisfactory situation was formed with the supplies of freight cars by industrial plants. Among them, the Kryukovo and Uralvagonzavod short-supplied respectively 2,656 and 1,138 gondolas, the Zhdanov—3,128 tank cars, the Dneprodzerzhinsk—1,358 flat-cars, and the Stakhanov and Altay plants—respectively 881 and 1,332 closed cars. Over 80 percent of the total output of freight cars for the national economy goes to these plants, and their reduction in production volumes as compared with last year by an average of 15 percent

practically eliminates the possibility of making up in 1989 for the lagging behind permitted.

In the year under review, with the plan being 85,924, 82,290 new containers were supplied, or 95.8 percent. The lagging behind was permitted mainly for 20-ton containers (3,671 units or 17.7 %), and specifically, the Abakan plant alone short-supplied 2,017 units.

Economic and Social Problems

The transition to economic methods of operation, mobilization of intraeconomic reserves, intensification of production processes, boosted introduction of achievements of scientific-technical progress and advanced experience, particularly the Belorussian method, played a positive role in solving a number of social problems and raising the standard of living for the railroad workers.

Labor productivity for last year increased by 3.9 percent, and by 4 percent against the plan, transport cost was reduced by 0.2 percent, and about 454 million rubles worth of above-plan profit was obtained. The assignment for labor productivity was fulfilled by all the roads, with the exception of the Moldavian and West Siberian. At the same time, its growth rates on the West Kazakhstan, Southeastern, Oktyabr, Southwestern and Northern roads reached 5.5-7.7 percent.

One of the important reserves for the growth of labor productivity is to reduce the losses of work time due to demurrage, absenteeism and administrative leaves. Last year they increased by 0.1 percent. The social-economic measures carried out had a positive effect on reinforcing work discipline and assigning personnel. Labor turnover in 1986-1988 was reduced by 10.1 percent, to 9.7 percent. On the whole for the network, absentee work days were cut in half. Only on the Transcaucasus road did they rise by a factor of 1.4.

The transition to full cost accounting, combined with the introduction of the Belorussian method, made possible a better solution of the social problems. Under the conditions of the transition to the new wage and salary rates, the greatest growth rates in wages were at the enterprises for the basic activity of the railroads, subways and Promzheldortransport. As was noted, in the three years of the five-year plan the average monthly wage of workers engaged in transport rose. Its greatest increase was on the Baykal-Amur, Far East, Transbaykal, West Kazakhstan, Sverdlovsk, Moscow and Oktyabr roads. Under comparable conditions its growth was 10.5 percent, which corresponds to the normative relation established for last year (0.6) of the growth rates of labor productivity and the average wage. While since the beginning of the five-year plan, normative relations of the growth rates of labor productivity and wages have been observed, according to the 1988 results they were held back only on the Southern road. They were violated by considerable amounts on the Tselina, East Siberian, Baykal-Amur, Odessa and Transbaykal—by a factor of 2.8 to 3.1, on the Sverdlovsk and Kemerovo—by 4.1 and on the West Siberian—by a factor of 5.4. As a result, in the network of roads the established norm was more than doubled.

In the past year, 741 million kw-hrs and 443,000 tons of fuel were saved. The East Siberian, Southwestern and Azerbaijan roads permitted an overexpenditure of electric energy. All the roads saved on diesel fuel.

In 1988 greater attention was paid to increasing the production of consumer goods and expanding paid services for the population. The State order for production of non-food consumer goods was fulfilled ahead of schedule—on 29 November. As a result, 10.7 million rubles worth of goods were produced above the plan, or 12 percent. As compared with 1987 the production volume in 1988 was increased by 35 percent and is 99 million rubles.

A total of paid nonspecialized services for the population amounting to 478 million rubles was carried out, which is 16 percent more than the assignments established for the enterprises of the Ministry of Railroads by the councils of ministers of the union republics. The increase over the 1987 level was 95 million rubles, or 25 percent. Failing to cope with the plan were the Baykal-Amur—86 percent, the Central Asian—90 percent and the Far Eastern—92 percent.

The draft of the plan for economic and social development in 1989 was drawn up in accordance with the Basic Statutes for Fundamental Restructuring of the Administration of the Economy and the Requirements of the USSR Law on the State Enterprise (Association). On the basis of the requirements of the national economy for transport, the total volume of freight shipment was planned in the amount of 4120 million tons, including 2479 million tons (or 60.2 %) for the state order and 417 billion passenger-kilometers. Labor productivity should increase by over 20 percent of the 1985 level. It was stipulated that 540 million rubles of profit be obtained. Plans were also determined for other indicators of the sector's work. Its successful fulfillment can be guaranteed on the basis of eliminating shortcomings and including available reserves in the operation and raising the quality of transport service.

Transport Science and Technical Progress

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[Text] **Railroad transport is one of the key sectors of the USSR economic system. The extent of the road network today exceeds 145,000 km. Of them, 50,000 km are**

electrified. In 1988 the railroads transported almost 4.1 billion tons of national economic freight.

Successful operation of the "steel mainlines" requires widescale introduction of the achievements of scientific-technical progress in organizing transport and improving and updating the technical base of railroad transport. The Ministry of Railways has developed and is steadily putting into practice a group of target scientific-technical programs, directed toward intensifying the transport process and developing a technical basis for the sector. They primarily specify development of the driving of heavy-load, long-consist and combined trains, a rise in speed and freight delivery, mechanization and automation of production processes on the basis of modern computer and microprocessor equipment and development of automated control systems.

An Important Unit of Intensification

Increasing the average weight of a freight train plays a leading role in the sectorial scientific-technical programs carried out in railroad transport. The weight of the train is a comprehensive indicator characterizing the capacity and efficiency of the transport system and its potentials for rapid delivery of national economic freight. Raising the average weight of the train is an extremely important direction in accelerating scientific-technical progress in the sector. The role and significance of this powerful lever for intensifying the operational activity of railroads are determined by the need for further increase in freight transports under the conditions in which, on many freight-intensive routes, the reserves for increasing the amounts of traffic have already been exhausted, given the way the rates of constructing new lines are lagging behind the growth rates of freight turnover.

At the same time, increasing the weight of the train is also a complex scientific-technical problem. It requires solving a broad range of problems: selecting the system for formation and the schedule of large trains, their tractive support, allocating locomotives in consists, efficient driving and safe braking of the trains, organizing their technical service, intensifying the power supply, locomotive, car and track service, STsB [signalization, centralization and blocking], and communications.

The target scientific-technical program for raising the average weight and length of trains, worked out in the 12th Five-Year Plan, encompasses 49 very important network routes with a total extent of about 60,000 km. It stipulates that forces and resources be concentrated on intensifying the technical equipment and improving the traffic organization on the most important routes. To increase the average weight of a train, "bottlenecks" should be eliminated at stations, in power supply and at locomotive, car and route facilities, STsB and in communications. A system of organizational, technical, technological and economic measures, based on using the achievements of scientific-technical progress and advanced experience, is proposed.

Recommendations have been drawn up, in accordance with the results of studies made, to ensure the stable movement of large trains. They include the use of specialized schedules for the throughput of heavy-load and long-consist trains, evaluation of the load capacity of the tractive power supply system and determination of the optimum interval between trains. In a number of cases intensification of the electric supply was specified to fulfill the schedule, through replacing transformers with more powerful ones, and particularly on loaded routes—construction of additional intermediate substations and installation of section posts, suspension of additional lines, and parallel connections of the contact suspensions of adjacent tracks. Along with this, at a number of stations the entry-exit tracks should be lengthened and their structure intensified through laying heavy tracks, including heat-strengthened ones, as well as through improved switching assemblies, an expanded polygon of asbestos ballast, etc.

An example of a comprehensive approach to increasing operational efficiency on the basis of increasing the weight and length of trains is the experiment of the South Urals Railroad, which, with the use of a multi-unit remote control system (SMET) new in principle, created at the VNIIZhT [All-Union Scientific Research Institute of Railroad Transport], intensified the hauling support, and in shortened periods, by its own efforts, extended the station tracks and prepared other facilities for trains with increased weight and length. At other railroads, the VL10, VL10U, as well as the VL80K and VL80T electric locomotives are also equipped with the remote-control SMET system for working with a multi-unit system; equipment for diesel locomotives with synchronous control is specified.

The introduction of a system of multi-unit control (ASME) for VL80P electric locomotives with electronic regulation of the work conditions, developed by scientists of the VNIIZhT, is being expanded. It makes it possible to automate control of a chain of locomotives (16 axles) under hauling and recovery conditions with smooth three-way regulation.

In consideration of the experience accumulated, studies were made which made it possible to develop technology for the service of trains with increased weight and height. Technical boundaries of the norms of freight train weight and consist length were expanded, ensuring the necessary level of safety for their traffic.

Improving the technology of the work of sections and entire routes contributes to the modernization of the rolling stock: replacing automatic coupling and automatic braking equipment with improved equipment (for example, using a combined main brake line, introducing improved No 483 air distributors), converting cars to composition brake shoes. Saturating the car fleet with rolling stock on roller bearings and improving the quality of the repair are today making it possible to lengthen the sections of inspection-free running, and at the same time to organize non-stop throughput of trains with increased

weight and length. Widescale use of new methods of driving trains under conditions of hauling and braking are stipulated, including combined trains with different systems of arranging locomotives in a consist.

A dynamic model of driving a train using microprocessor equipment has been developed, and on its basis, a trainer and information-reference system for locomotive engineers. A promising solution, ensuring reliable driving of trains with increased weight and length, is the use of automated control systems based on microprocessors, which mainly take on the complex functions of driving these trains.

A car-laboratory with a modern automated measuring-computing complex based on a micro-computer, is used to make complicated integrated tests (hauling-power, current, current-dynamic) of locomotives. The test equipment for this laboratory "on wheels" ensures synchronous recording of over 30 parameters and obtaining data new in principle, and also makes it possible to produce efficient data processing and to correct the test conditions during the test. Further improvement in the moving laboratories on the basis of using modern technical devices such as microprocessors, high-speed analog-to-digital converters and optic-wire lines, substantially improves the technical characteristics and expands the possibilities for the entire measuring-computing complex.

Widescale use of modern car laboratories on railroad networks should ensure a substantiated selection of the optimum weights for trains and conditions for driving them. Statistical processing of a large volume of information, obtained as the result of test trips on a given section, makes it possible to give objective recommendations in short periods on the maximum weight of the train, the change in its driving conditions and other parameters.

New Transport Technology

Improving the development of the network plan of forming trains and the traffic schedule with widescale use of electronic computers plays an important role in the creation and widescale introduction of intensive technology to organize and control transport. The leading scientific direction in the sphere of organizing car flows is to create a methodology for calculating a unified plan of formation for all the technical plans of the network and all categories of freight trains. Scientific research has been fulfilled and introduction begun of automated calculations of intraroad plans for train formation. On the basis of modern computers, a system was developed which contains the entire transport network with detailing right down to each train-section and over 300 shunting systems. It is designed to optimize the integrated use of the throughput and processing capacities of the road network. Correction of the train-forming plan has been automated for the first time, and this ensures integrated calculation of the potentials of the sections and shunting stations for train throughput and car processing. For example, changes in the organization of car flows stemming from the natural disaster in Armenia were introduced on this basis for the first time.

Operating the system showed that through optimizing the calculations, the additional run of cars could be reduced by 10-15 percent, the yearly volume of transport work reduced by 220 million car-km, and a yearly saving of operating expenditures of about 11 million rubles obtained. On the whole, the release of loading resources through carrying out the group of tasks for the automated system of organizing car flows is about 25,000 cars a year, and the increased transport volume is at least 9 million tons a year.

New technology to make up the traffic schedule of trains, singling out a stable part of the train flow (nucleus), has been worked out and introduced on a polygon of single-track lines of 22 railroads. They specify, in particular, widescale use of package throughput of trains and intensive use of track development of stations with the so-called strip-package schedule. A system of interval regulation of train flow is being introduced on freight-intensive two-track lines. This raises locomotive productivity by 4-6 percent and by 6-8 percent for the locomotive brigade, with a considerable improvement in the organization of their work.

Automated calculations of the traffic schedule are presently being made for two-track and single-track sections with a total extent of over 30,000 km. All of this makes it possible to raise the level of use of the throughput capacity by 5-7 percent on the average, and of section speed—by 3-5 percent. Work is now being done to ensure full automation of making up the traffic schedules for trains, including in the calculation schedules for all types of services—passenger and suburban, transit and local—in consideration of the new requirements of handling long-consist trains of various categories.

Under the conditions of transition to contractual supplies of raw material and finished products, of objectively existing inequalities and growing differentiation in train categories according to speed, the schedule should specify stable handling of some of the freight trains according to the schedules assigned—so-called industrial routes. An important stage in solving this problem under the new conditions of economic activity is developing the "Ritm" unified intersectorial technology to organize transport, which combines the operational and economic principles of ensuring a smooth flow of transport and increased speed of freight delivery and preservation. Polygons are outlined to process and introduce it on the networks. New approaches are now being worked out in the development of this promising direction, to improve the technology of station operations, plot train traffic schedules and systems of organizing car flows and operating locomotives and locomotive brigades, which will make possible a considerable rise in the quality of the transport service and raise the revenues for the railroads.

A very important direction in intensifying operations is introduction of methods, new in principle, for efficient control of transport. So far the railroads have used only an information-reference mode in this area, and automation is carried out mainly in the sphere of expanding and increasing the accuracy of the information on the transport process. Planning problems are automated only for monthly and longer periods. The next stage in solving these problems is widescale use of computers, particularly the personal computer, and dialog procedures, for online planning.

A major step in scientific provision of control apparatus was taken in the sphere of online regulation of the car parks, including automated calculation of the plans for turning over empty and laden car flows and the needs and dislocation on the network of various types of rolling stock to transport national economic freight and the qualitative and quantitative indicators of the operations of the railroads and network as a whole. Automated work places have been set up for operations personnel making decisions with the aid of a microcomputer on regulating the fleet of tank cars. This has made it possible to reduce their empty run by an average of 2 percent.

A set of scientific studies in the sphere of creating an ASU [automated control system] for the locomotive fleet has been completed. Virtually all the railroads have introduced an automated control system for the state and dislocation of the locomotive fleet (OKDL). A similar ASU will be introduced during this five-year plan for the locomotive brigades (OKDB). Its first stage is being widely implemented right now—compilation of designated schedules for the work of locomotive brigades. They have encompassed over 130 locomotive depots. The use of designated schedules for the work of locomotive brigades will make it possible to increase their labor productivity by 5-6 percent, with a considerable improvement in the work conditions. Introducing the entire set of problems to the ASU of the locomotive fleet will make it possible, on the whole for the network, to accelerate car turnover by 2-2.5 percent and increase locomotive productivity by 5-6 percent.

A new concept has been worked out to improve the management structure of the transport process. It is based on the creation of automated centers of dispatcher control at the road and network level. The yearly economic effect from introducing the system will be about 70 million rubles.

The collective of the Scientific-Engineering Center (NITs) of the VNIIZhT [All-Union Scientific Research Institute of Railroad Transport] is working on a solution to the problem of creating intensive technology for local work, based on widescale use of modern computer and microprocessor equipment. A new form of developmental organization has been applied here: from the idea to the "turnkey" introduction, with personnel training and the "accompaniment" of new technology during the first year of operation. The mathematical models created at the NITs will make it possible, in brief periods, to develop such mass technological processes as control of shunting work, forecasting the supply and delivery distribution of local freight and controlling the loading of freight into the cars by using computers and information for the clientele on the arrival of freight for unloading.

A method of combined shunting of cars developed by the NITs is being widely introduced. It ensures a 2-3-fold reduction in the time for performing shunting operations, as compared with the traditional technology. At the same time, optimum control of shunting operations at the stations and in the transport shops of enterprises is carried out by means of a microcomputer. The electronic shunting dispatcher performs all the basic control functions at the freight station and ensures a 15 percent reduction on the average of all types of idle times for cars, and 20 percent for locomotives. Widescale use of a micro-computer substantially changes the nature of operations for the workers in such mass specialties as duty attendant for the station and freight cashier.

Experimental checking has been completed and widescale introduction of the methodology for calculating optimum systems of loading freight into the cars by computer has begun. This has already ensured an increase in the static load at 15 enterprises by an average of 15.3 percent. In 1989 the new technology will be introduced at all the divisions of the base—Moscow—road. New developments of the Scientific-Engineering Center entail broad use and development of a combinatorial method of classifying containers, small shipments, heavy-weight freight and methods of placing freight on rolling stock.

Reliable Technical Support for the Transport Process

Application of the results of scientific research on railroad electrification has been directed toward widescale introduction of intensive technology for transport. For example, to ensure the driving of trains with increased weight, VNIIZhT, in conjunction with the transport VUZes, developed the concept of multiple-wire tractive networks of electrified railroads, using alternating current (25 kV systems, with screening and intensifying lines, 2 X 25 kV), which have balanced electrical parameters, increased load capacity and a lower level of electromagnetic effect on communications related to the railroad. The system makes it possible to conduct, by stages and fragmentally (according to individual sections), the intensification of the tractive electrical supply with minimal capital investments.

A large amount of work was done in conjunction with industry and railroad specialists to increase the load capacity and reliability of elements of electric tractive supply. Transformers were created with 6-and 12-phase rectification, as well as natural cooling and reduced losses of electric power, UR-2 and URI discharging devices for shunting reactors, which permit a 1.5-fold increase in resources for electrical wear-resistant circuit breakers and a 20 percent reduction in the burn-out of

contact wires, standardized valve-type arresters, reducing the number of cases of insulation breakdown by 20-25 percent, new smoke-extinguishing chambers with greater interrupting capacity and multiple action spark gaps and short-circuiting switches.

Soviet railroads hold leading positions for the number of developments for the contact-wire system. For example, VNIIZhT developed a section insulator which was patented in Argentina, Austria, Italy, Greece and other countries, and a license was sold to the People's Republic of Bulgaria. Negotiations are being carried out on supplies of the section insulators by contracts to India, China, Argentina, Romania and other countries.

The use of polymeric insulators for all types of contact-wire network (suspended, tension, clamp, cantilever, supporting, etc.) on electrified sections has begun. They are not inferior to foreign models with respect to their technical-economic characteristics. Within the framework of the sectorial program, by the end of the five-year plan, our electrified roads will receive at least 20,000 polymeric insulators. A sharp increase in their output is slated in the 13th-14th five-year plans. Negotiations are in progress on supplying polymer insulators by contract to China, India, the People's Republic of Bulgaria and other countries.

In addition, there is widescale introduction on the railroads of improved porcelain and glass insulators. In conjunction with the Magnitogorsk Metalware-Metallurgical Plant (MMZ), new structures were developed for multi-wire bimetallic aluminum-steel wires. They replace the steel-copper wires which are now mainly used in contact-wire systems. Therefore copper, which is now in very short supply, will be conserved. In the 12th Five-Year Plan alone, this will save about 2000 tons. Interest in obtaining this product has appeared in the Hungarian People's Republic, the People's Republic of Bulgaria and the PRC. Series introduction of low-alloy contact wires, with high wear-resistance (30-35 percent higher than copper wires) and 20 percent higher fire-resistance, has also been developed.

VNIIZhT has developed a process for blast welding of multi-wire leads for the contact-wire system, instead of using bolt clamps, which is being widely used on electrified railroads. It has ensured high reliability of the joints in electrical supply systems and a saving of nonferrous metals, electric power and labor resources. At present over 500,000 joints in the system have already been welded, and an economic effect of over 3 million rubles obtained. For a further reduction in the wear intensity of contact wires, the institute, in conjunction with industry, developed and manufactured an experimental-industrial batch of metal-containing carbon inserts.

TsNII-KZ anti-glazing lubricant, developed by the VNIIZhT, helps to improve the current collection when sleet forms on the lines of the contact-wire system. Special units have been developed and passed on to the roads to mechanize its application to the wire. Introducing on the road network a small portable "Filin" implement for long-distance monitoring of the state of the contact-wire system insulation has proved very effective.

The increase in traction loads required an examination of the protection of the contact-wire system against short circuits. An adaptive long-distance protection has been developed for direct current sections, and protection, using integrated circuits and microcircuits, corresponding to the world level, has been created for alternating current sections.

It would be impossible to ensure intensive transport technology without remote control of energy-supply devices. In the last few years the institute created a new generation of remote-control systems (MRK-85) using integrated circuits and microassemblies and printed wiring with thick-film technology. The system possesses doubled information capacity and new system solutions along telemechanical communication channels with great operating stability. It is calculated for control, within the dispatcher range, of 1500 energy supply objects and remote control of up to 4000 objects, and has been put into operation on the Moscow-Ramenskoye section of the Moscow road.

Right now work is in progress to create highly efficient diagnostic systems for the units of traction substations and contact-wire systems. The set of diagnostics for contact-wire system devices, located in the car, will have expanded functional potentials and modern microprocessor and computer equipment. Scientists are working on a technology, new in principle, for the service and repair of a contact-wire system. Its ultimate goal will be to increase the level of mechanization for this work from 18 to 50 percent. The type-and-size line and technical specifications for a chain of machines and mechanisms making it possible to go beyond this milestone, are being worked out.

Being developed along with this is a set of electrical equipment for traction substations, based on controllable semiconductors. This type of traction substation ensures arcless suppression of emergency currents, a rise in the reliability of the electrical supply, the voltage quality and electromagnetic compatibility and a reduction in service expenditures. The most recent achievements in the sphere of high-temperature superconductivity make it possible to rely on the use of highly efficient energy accumulators. The potentials for their use to intensify direct current sections are being developed.

In the sphere of electrical rolling stock, scientific research is being directed toward a further increase in the technical-economic efficiency of traction. Tractive power and operating tests of new 12-axle VL85 and VL15 electric drives are being made. The electrical equipment of the VL85 electric locomotive is made on the basis of the three-way transformers and electronic control systems of the VL80R electric locomotive, which were created on the basis of proposals by and with the direct participation of the VNIIZhT.

Work has been done on increasing the power characteristics of an alternating current electric locomotive, and there is wide research on increasing the power factor through capacitance compensation of the reactive power on the locomotive. The problem of using it on the VL85 electric locomotive is being worked out in conjunction with industry. Multi-phase control of the transformers of the electric locomotive, combined with compensation, will not only increase the power factor of the electric locomotives, but will at the same time simplify the structure and reduce the cost of the three-way transformer.

Solving the problem of creating a commutator-free traction drive is very important. The second stage of work on a thyratron (synchronous) motor is nearing its conclusion: the experimental VL80V electric locomotive has successfully passed the test at the Experimental Ring of VNIIZhT and trains weighing up to 6000 tons were driven stably on the North Caucasus Railroad. The tests confirmed the possibility of creating this type of drive using a modern element base and the reality of achieving a future axle power of up to 1200 kV and over. The new commutator-free motors are considerably more reliable and have a broader range of full power use.

Extensive work is being done to create and improve a new generation of mainline diesel locomotives: the 2TE121 freight locomotive with 2 X 4000 h.p. and the TEP70 passenger locomotive with 4000 h.p. The introduction of new diesel locomotives will ensure a rise in the train weight on the polygon for diesel locomotive traction by an average of 20 percent, speed—by 10 percent, and fuel economy—by 10-12 percent. The future trend of research in the sphere of diesel locomotive traction is to work out the problems of using modern microprocessor equipment in control and diagnostic systems.

Research on developing and implementing practical measures to raise the speed of trains is being carried out within the framework of the Uskoreniye [Acceleration] scientific-technical program, jointly with administrations of the Ministry of Railways, the railroads and the transport VUZes. Optimization has been implemented and the sequence determined for remodeling the lines of the high-speed polygon of the railroad network. The possibilities of increasing train speed through partially rebuilding the lines in the plan have been studied: changing the radii of the curves, the length of the transition curves and the straights between curves. The economic problems related to increasing train speed have been studied.

The revolutionary changes in railroad transport as a whole, which are expressed primarily in the transition to train speeds new in principle, ensure the carrying out of the program, now being developed, to construct specialized high-speed passenger mainlines from the Center to the South with speeds of 300-350 km/hr. Work on determining the operation and technical parameters of the mainline is now being done through the combined efforts of the scientists of the sector and industry. The development of technical devices, new in principle, for this will be implemented on an intersectorial competitive basis.

A fundamental improvement in the organization of passenger transport service is the subject of particular concern. Problems of automating ticket-office operations are being successfully solved. Now in operation is a unified all-union system of ticket-sale control on long-distance runs, "Express-2", with seven regional centers hooked in to it—Moscow, Leningrad, Kiev, Sverdlovsk, Kuybyshev, Odessa and Kharkov. The system ensures a 2-2.5-fold rise in the labor productivity of ticket-offices and an improvement in the use of car capacity. The EKASIS reference-information system has been developed and introduced on its basis.

A group of studies was recently made on organizing the handling of long-consist passenger trains for long runs on passenger-intensive routes. Their results showed the technical and technological possibility of operating trains in a consist of up to 24 cars, and on combined trains—even over 30 cars. This will ensure carrying passengers in the periods of mass summer transport on routes with an inadequate throughput capacity. Also worked out is a process for converting paired electric locomotives with consists made up of 20-24 cars for suburban service.

Major studies are being carried out in the sphere of improving the structure of the passenger car fleet and improving its equipment and technical service and repair systems. For the technical requirements, a type VKhP test car has been created by the VNIIZhT and the GDR, in which a refrigeration unit with increased reliability and an alternating current motor have been used, as well as new technology for the thermal insulation and a new heating system. The energy conservation in the heating and air conditioning is up to 15-20 percent.

A system for energy conservation on passenger trains on the diesel locomotive traction polygon has also been developed (with a 2TE116 diesel locomotive), which is sufficient to ensure electric power for a 24-car passenger train under any operating conditions. Along with this, possibilities are being studied of using systems, new in principle, with various types of heat pumps, on passenger cars. They make it possible to do away with using ecologically harmful freon and to obtain a virtually repair-free structure and improve passenger comfort to a considerably extent. New, highly efficient fire-proof (glass-phospholic and fire-protected multi-layer plywood) and corrosion-proof materials for passenger cars have been approved and recommended for series production. The use, for example, of new corrosion-proof steel ensures a 2-ton reduction in the mass of the body of the passenger car and eliminates the need for paint and repair throughout the service life.

Eliminating Manual Labor

A very important social-economic task for railroad transport workers is to raise labor productivity and reduce

manual labor. This requires broad, integrated automation and mechanization of the production processes on the basis of modern computer, microprocessor and robot equipment.

For this purpose, an industrial chain of machines, which ensure complete mechanization of track repair and maintenance is being created for track work. Series production of MPD-2 motor platforms, manufacture of the adjustable series of the UK-25/20 stacking crane and KShZ machines for a single tie shift has been developed in the current five-year plan. A car-laboratory with a device for measuring the lengthwise structure of station tracks has completed its acceptance tests and been recommended for series production. Experimental models of VPR-02 and VPRS-02 surfacing-tamping-respiking machines have been manufactured and are being tested. A test model of the VPO-3-3000 machine is being manufactured. Design documentation has been drawn up and a test model of a high-speed track-measuring car with automated information processing by means of an onboard computer is being developed.

On the basis of research done by the VNIIZhT, series output has been set up for a BUM ballast-heating machine, as well as ROM-3 machines to clean and scrape dirt from the rails and UBRM machines to set the roadbed straight. Putting them into operation will make it possible to improve the quality and raise the productivity and level of mechanization of work for repair and routine maintenance of the track. In this five-year plan a set of devices to automate track surfacing, the VPR-1200 machine, was developed and utilized. Research is being done on creating a set of track machines for diagnostics.

The major long-term task is ensuring a high technical level for track work. Right now, in conjunction with industry, work has begun on developing a number of new machines needed for complete mechanization of track work. Among them are a rail-grinding train with active working elements, machines to drive in the spikes and line up the ties, and a high-speed leveler. Work will be done, within the framework of the State Program for Railroad Reequipment and Modernization in 1991-2000, on developing a unit track layer with increased productivity, machines to straighten out the rails, a ShchOM-5 ballast-reclaiming set, a BUM-2 ballast-packing machine and VPR-03 and VPRS-03 surfacing-tamping-respiking machines.

In the last few years, the priority problems solved by sectorial scientists included developing technical devices and technology for complete mechanization of snow-clearing work. Beginning in 1987, devices were introduced for electric heating of switch assemblies, to clean the snow and ice from them. Before the end of the five-year plan, 10,000 switches will be equipped with them, and in the future—about 180,000 switch assemblies. This will permit a 6-8-fold reduction in labor input to clear track junctions and intersections and will ensure reliable station work under winter conditions.

The cost is reduced by a factor of 5 and the diagnosis of an operated subgrade is accelerated by the use of the Poisk vibro-seismic system, new in principle. It has been introduced on 14 railroads and has ensured a reduction in the number of sudden elevated approach collapses by 50 percent. New diagnostic methods have been used successfully in surveying the subgrade on the karst rock sections of the Lvov Railroad, the swamp sections of the Northern Railroad and the permafrost sections of the Baykal-Amur Mainline.

The highly efficient VZPG-VNIIZhT rate-reducers, which have begun series production and been introduced on the road network, will contribute to increasing the processing capacity of the shunting stations and eliminating the heavy and dangerous work of the speed regulators. They have a 1.5-fold greater braking capacity, 1.5-fold lower metal-intensiveness and require 7.5-fold less electric power than the best domestic models.

An experimental-industrial batch of various versions of devices to secure rolling stock on station tracks has been produced. Work is being done on developing experimental models of an automatic uncoupling handler and a buffering-up car. The development of technical devices for automation and mechanization of work at the car PTO [technical inspection point] should be completed in the current five-year plan. Therefore, in conjunction with the microprocessor system for hump automation, worked out by the RIIZhT [Rostov-on-Don Institute of Railroad Transport Engineers], the problem of complete automation and mechanization of shunting station work should be solved.

To increase labor productivity in shunting operations, a radio control system for locomotive shunting (SMETR-M) has been developed, which can be used for automated control of locomotives from the electrical centralization post or the control post for the shunting operations at the shunting humps, sending the cars to the loading-unloading fronts, and also for performing other operations.

A substantial increase in labor productivity when the cars are unloaded is ensured by the family of vibration-looseners for frozen freight, widely used on the railroad network. Each of these vibration-looseners replaces the labor of 15-20 workers.

Saving Resources and Materials

Railroad transport is an energy-intensive sector of the national economy. Therefore, one of the most important tasks in accelerating scientific-technical progress is saving fuel-energy resources and reducing the energy-intensiveness of railroad work. Within the framework of general State measures in the sector, an automated control system for fuel-energy resources is being worked out and introduced. Among the problems solved by it are control, calculation, norm-setting, revealing reserves for economy and seeking promising energy-saving technology and technical devices, new in principle.

At the present time, major studies are being made on conserving and replacing diesel fuel with natural gas on diesel locomotives. Estimates show that diesel locomotives serving about 43,000 km of railroad, can be driven on this type of fuel, releasing up to 4 million tons of diesel fuel a year.

In a very short time, a mock-up model of the TEM2U shunting diesel locomotive was developed and built. It operates on compressed natural gas, and stand and train tests of the locomotive have been made. A test batch of these locomotives has been developed at the Bryansk Machine Building Plant. Work is being done on creating a test model of the ChMEZT type diesel shunting locomotive at the ChKD-Prague Plant (Czechoslovakia). The output of the shunting gas-diesel locomotives will ensure the replacement of 50-60 percent of the diesel fuel with gas, and will improve the state of the environment.

There are other approved solutions to conservation of fuel-energy resources. Among them should be noted the highly economical systems of cooling the tractive equipment, primarily the automated cooling system for alternating current electric locomotives. As tests have shown, the actual saving from using this system is about 8 percent of the expenditure for train traction. A microprocessor control system for electric-trains has also been developed. Its experimental operation at the Moscow Railroad depot showed that the system provides accurate fulfillment of the traffic schedule and catching up with a delay for the assigned program and ensures fulfillment of the speed restrictions and stopping in front of red-light signals. At the same time, optimization of conditions ensures a saving of 5-10 percent of the electric power.

A system has been created to heat diesel locomotives that are in storage, from stationary heat supply sources. Its introduction ensures a saving of about 1 percent of the diesel fuel expended to haul the trains. Along with this, scientists have proposed a combined burner to burn natural gas and mazut in the boiler units of centralized heat-supply junctions and stations. It increases the boiler productivity by a factor of 1.5-2.

Railroad transport is a major consumer of material resources. Just a 1 percent reduction in their consumption gives an additional profit of about 45 million rubles, which is particularly important in railroad work under the conditions of full cost accounting and self-financing. The basic directions of development in this sphere are increasing the reliability of the rolling stock and the route and creating highly efficient technology, new in principle, for repair and restoration of parts and assemblies. The use of new types of rails and switch assemblies gives a yearly saving of 100,000 tons of rail rolled metal, and using corrosion-resistant steel for transport equipment and replacing metal materials with non-metal—a saving of rolled ferrous metal of 40,000 tons a year.

Along with this, advanced technological processes have been worked out to manufacture and reinforce parts for transport equipment, the production technology for inserting bearings made of bimetallic strips, and aluminum journals for freight cars and new types of contact wires and disks have been created, ensuring a considerable saving of copper. The technology of mass output of standard crossings, reinforced by blasting, has been improved, and mass output has begun. This technology is patented in Great Britain, Austria, India, France and the FRG. An agreement on sale of the license to the Indian firm HDK has been signed.

The introduction of a number of industrial processes for welding and overlaying parts and structures, developed by VNIIZhT scientists, has ensured a considerable saving of material resources. Overlaying restores 90,000 crossings on the railroad network every year. This makes it possible to save over 150,000 tons of high-magnetized steel. The saving in rail metal from using overlaying to restore the worn ends of rails is 16,000 tons a year

A considerable amount of material resources are saved by restoring the rails in places where the rolling surface is damaged by gas-powder overlaying. The new technology provides for repairing the rails without interrupting train traffic. At present, over 1000 rails and rail lengths are restored by gas-powder overlaying, and a saving of 450 tons of steel has been obtained. It is planned to bring the volume of repair by gas-powder overlaying up to 10,000 rails a year, which will permit a yearly saving of 7500 tons of rail steel.

In conjunction with the Institute of Electric Welding imeni Ye.O. Paton, of the UkSSR Academy of Sciences, sectorial scientists are performing important research on developing a new technology to repair the welding of the frames of automatic couplings, the beams over the springs and the side frames of the carriages of freight cars, as well as assemblies to seal the supports of gondolas, which have been rejected because of the formation of cracks during operation. A process developed to reinforce the bushings of diesel locomotive cylinders by using laser power ensures a 1.5-fold increase in their wear-resistance. Introducing organosilicon hermetic-sealing materials of the Elastosil brand to wind the armature of electric traction motors reduces the damage to the machines by 20 percent and increases the service life of the armature insulation by a factor of 1.5

Many questions concerning ecological problems and environmental conservation in railroad transport are being resolved. Among them are the development of ecologically safe technology and agents to clean rolling stock during repair and service, waste-free technology for the centers preparing rolling stock for transport and creation of ecologically safe industrial processes for anti-corrosion and hydro-insulation protection of railroad transport objects. An important place is devoted to the problem of preserving timber stands, to increasing the water storage, protective, sanitary-hygienic, health protecting and other natural properties of the forests on the basis of maintaining their proper ecological condition and carrying out measures for forest planting and outstripping rates of reforestation

The innovations and the scale of the tasks facing railroad transport under the conditions of restructuring the entire national economic complex of the country require full intensity of forces, a creative approach to solving the problems that arise and concentration of the scientific potential on priority scientific-technical problems. The utmost acceleration of scientific-technical progress in the country's railroad transport will make it possible for it to exceed world achievements in the decisive qualitative and economic indicators.

A Course in Automation

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[Text] **Improving transport control through further development and interaction of means of automation, remote control, communications and computer equipment, and creating advanced technology for the transport process on this basis play an important role in increasing the efficiency of transport service for the national economy. This powerful arsenal of technical resources and technological methods is called upon for active influence on improving the ultimate qualitative and quantitative indicators of the sector's work. This should be achieved by creating the conditions for stable fulfillment of the planned assignments on the basis of making decisions on the control and 'se of optimal conditions for regulating transport with eft.cient use of the reserves and resources of railroad transport.**

What an Analysis Shows

At the present time, 66 percent of the railroad network, including all the most important routes, are equipped with automatic blocking and dispatcher centralization, 88 percent of the switches laid at the entry and exit tracks of the stations are included in the electrical centralization and over 50,000 km of line connections have been calibrated. Several million channel-kilometers of telephone connections and many tens of thousands of radio stations for various purposes are in operation. Information-computer centers, in which about 1000 various computers with a total productivity of several tens of millions of operations per second have been installed, have been created on all the roads.

A considerable amount of scientific-research and planning-design work has been done. As a result, the production and introduction of a number of advanced systems and devices for automation, communications, computer equipment and ASU [automated control system] have been developed. They include a new elemental base of microelectronic equipment and electromagnetic relays, which have become the basis of building advanced systems for automation and ASU of industrial processes, new systems for automatic blocking, capable of operating reliably with lowered resistance of the ballast and a new generation of electrical centralization, including an industrial installation system. A microprocessor hump complex has been put into operation at five stations. It has become the basic device for introducing a network at other shunting humps. Development has been completed and industrial assimilation begun of a set of devices of a new generation of railroad online-technological wire and radio communications.

The first section of an automated system of online transport control has been introduced on virtually all the roads. Its information-program base is the basis of an efficient system of transport process control, created on new organizational and technological principles. Scientific elaboration of problems has been completed and the transition has been made to centralized control of transport based on an automated dispatcher control center (ADTsU MPS). Problems related to restructuring the organizational-functional structure of the central command staff of the Ministry of Railways have been worked out. Through just the basic measures carried out to introduce objects for automation and control systems, over 55,000 workers of the operations staff were freed in the past five-year plan.

Within the framework of sectorial scientific-technical programs, in the sphere of automating technological processes and control in the current five-year plan, work is continuing on the development and introduction of highly efficient technological processes and technical devices, which are aimed at a further increase in the throughput and carrying capacity of the sections and the processing capacity of the stations, improving the dispatcher supervision for the train operations and increasing the safety of the train traffic. In accordance with all the title sheets for capital investments, 10,000 km of automatic blocking and dispatcher centralization are to be constructed, 35,000 switches are to be included in the electrical centralization, at least 25 shunting humps are to be automated and 15-20,000 km of cable communication lines are to be constructed, thus completing the development of the mainlines connecting the Ministry of Railways with all the road managements. Through the basic activity it has been decided to modernize the automatic blocking on sections with reduced resistance of the roadbed insulation and to put into operation a new system of automation and signalization with increased reliability at 5000 grade crossings.

All of this will make it possible to release, during the five-year period, about 40,000 persons on the operations staff and obtain a saving of over 700 million rubles. The preparation and fulfillment of the equipment program for another 6200 km of lines with traffic amounting to up to 15 pairs of trains per day through simpler and cheaper devices for dispatcher centralization can give an additional release of about 16,000 switchmen and attendants at stations and obtain a saving of over 120 million rubles a year.

At the same time, in the last few years, a steady trend has been established toward reducing the rates of equipping the roads with advanced means of automation. Because of this, in 1990, the level of equipping the network with automated blocking and dispatcher centralization will at best be only 71 percent, and for electrical centralization—72 percent (of the total number of switches). Of the total number of shunting humps, so far only 156 have been mechanized and only 7 automated. This is substantially holding back the level of car processing at the shunting stations and makes it impossible to give up the heavy and dangerous manual labor of the speed regulators.

Developing the primary communications network on the basis of calibration creates the prerequisites for a substantial rise in the quality of the channels, expansion of the automated telephone network, creation of a network of online communication for the central dispatcher system of the Ministry of Railways and the roads, and a stable network to transmit data between the main computer center and the road information-computer centers. By 1990, however, the need for communications channels will be only 30 percent satisfied.

That is why work must be accelerated to develop digital transmission systems with pulse-code modulation and to ensure development and production of a specialized railroad cable. At the same time, work should be begun on introducing satellite communications to organize the necessary number of channels for the data transmitting network, which ensures efficient use of the resources of the computer equipment in controlling the transport process.

Radio communications from the auxiliary technological process control devices have become basic and occupy the leading place in organizing the train traffic, with possible failures of the STsB [signalization, centralization and blocking] devices, performing regenerating work, etc. The Transport radio communication system is called upon to solve this problem. Unfortunately, however, series production and introduction of the necessary amount of radio aids has, essentially, not yet begun. A large number of radio stations operated on the roads are obsolete. The roads still have about 50,000 ZhR-3 and ZhR-3M tube radio stations.

An analysis of the results of development and introduction of automated online transport control systems (ASOUP) at various levels attest to both achievements and shortcomings. The main conclusion is that the online control systems developed and introduced have on the whole confirmed the correctness of the automation directions chosen. In addition, creating the systems made it possible to lay the foundation for an information base of online transport control. At the same time, the existing ASU was created at different times, as increasingly new computer devices appeared. Therefore, each of these systems, while quite successfully solving the problems of automating control functions at its own level, does not in practice satisfy today's requirements for a unified transport control technology on all levels.

In addition, once again because of a lack of the necessary technical devices, development of the systems led to a contrary sequence—from top to bottom, and not the other way around, as should have been. Although the workers took all the possible measures and succeeded in creating a powerful network of interacting systems, based on automated intermachine exchange of information (the number of systems included in this network today exceeds 120), provision of the necessary technological interaction of the control levels has not yet been achieved.

An analysis of the work of the information-computer centers for the roads shows that the actual dynamic models of train and freight operations within the framework of today's ASOUP by no means fully reflects the present state of the stations, sections and entire regions of the roads. The reasons are varied. They include the late arrival or total lack of necessary information, erroneous (distorted) data and too much time for the computer to react to a change in the actual events, etc.

Information on the running of the trains arrives from 10-15 minutes to 2 hours late for some messages. This leads to a distortion in the train mock-up and causes an additional flow of queries to the system. There are cases of conscious distortion of data arriving at the computer, particularly in periods of turning over trains to adjacent roads. The volume of information on operational events with trains, with respect to the number of messages entered on the computer manually, is now 45-55 percent of all the arrivals in the system. At the same time, after the machine control, the computer issues a query for correction of approximately 20 percent of the messages.

A New Approach Is Needed

A substantial rise in the efficiency of the systems can be achieved through automating the receipt of information on the train position with devices for automated tracking and display of the train numbers on the basis of personal microcomputers, interacting with the STsB devices. This will make it possible to obtain information on the actual time scale, to release 110-180 operators for an "average" road, and to save approximately 150 channel-hours for information transmission, about 2-3 hours of "pure" machine time for the computer, i.e., 25-30 percent of its total nominal load.

Using automated work places (ARM) within the ASOUP framework for the operators of station technological document processing centers—primary sources, with simultaneous input of data to the computer network—will raise the labor productivity of workers in the mass occupations by a factor of 1.8-2. At the same time, the load on the channels can be reduced by 30-50 channel-hours and 1.5-2 hours of "pure" machine time a day freed.

There is one more quite important observation. The ASU existing on the railroads were created to be applied to the old technology, in which the level of use of reserves of the throughput and processing capacity of the stations, junctions and sections was substantially lower than now, the amounts of traffic were relatively small,

the locomotives operated on short service sections with assigned service, and there were no means and methods of automated control and data transmission systems. At the same time, under the conditions of putting into practice, on many routes, large amounts of train traffic, with small amounts of throughput and processing capacity, a considerable inequality occurs in the traffic, with insufficient reserves of accumulating capacities of the station track development. The growth of freight-intensive lines requires offering "blocking intervals" for high repair work productivity. For this there must be flexible online transport management.

It is becoming obvious that there must be a revision of the directivity of already existing systems and complexes and creation of means of automating process control, which will ensure a rise in management control through the interaction of devices for automation, remote control, communications and computer equipment, as well as the use of economic-mathematical methods, modern equipment and management theory. On the basis of the operations organization that has formed, a scientific classification of objects and regions of control should be worked out, and in consideration of this classification, of the distribution of functions and responsibility for the management staff. The optimum structure must be established for the operations management of the transport process for all levels (station, depot, road division, road management, Ministry of Railways).

The systems of traffic management and organization should correspond to each type of management region, creating the best conditions for fulfillment of the transport process under optimum conditions. In some cases they will be based on interval regulation of the train traffic, and in others—on the use of a schedule with a "nucleus" or rigid traffic schedule. Recommendations for their use should take into consideration the degree of unevenness in the transport process, the existence of reserves for track development at the stations and the throughput capacity at the sections, the technical equipment and the recommended organization of operations in adjacent regions. The control system, as the basic component, should also contain solutions for organization of the work of the locomotive brigades, the system of operating locomotives for train traffic in consideration of the presence and dislocation of the repair base and the conditions of online regulation of the location and work of the locomotives.

The strategy of the new approach to transport process control based on close interaction of the means of automation and computer equipment predetermines five basic hierarchical levels. These are: the existing systems of automation and remote control at stations and on stretches of track, automated control systems for the technological processes of train and shunting operations, including local microprocessor, information-control systems and automatic machines, organizational-technological automated control systems at stations, junctions and sections and transport process control on the road (region) and, finally, organizational-technological automated transport process control systems on the routes and networks of the roads as a whole. This multi-stage control structure necessitates a thorough study of the problems of technical realization of each level, choice of the optimum technical decisions and means of automating the processes of collecting, storing, processing and displaying the information, and improvement and functional development of STsB devices on a new elemental base.

The existing systems of automation and remote control of the first level (electrical and dispatcher centralization, automatic blocking, humping equipment, etc.) require improvement and further development on both the technical and the technological plane. The main feature lies in the fact that they should ensure a "juncture" with the devices and complexes of the computer equipment of the upper control level.

An exceptionally important role in this multi-unit structure is played by the second control level, which is based on a stage-by-stage realization of the optimum methods of regulating the processes of train and shunting operations on the basis of creating automated technological process control systems (ASUTP). At this stage of control, the economically substantiated distribution of loads among the individual objects and the technological equipment is determined, the optimum conditions for technological process control are maintained, and the appropriate commands (assignments, regulations) of the technological objects of control are issued and carried out.

The basis of the organizational-technological control systems of the three remaining levels should be a set of automated dispatcher centers to control the operations of stations, regions, roads and the network as a whole. At the same time, the technological and data base organization and support and technical and program devices for these systems should ensure solving the following problems:

—developing and carrying out all-encompassing (on the vertical and horizontal) technology for dispatcher control and solving the necessary problems of operations control;

—creating a system for electronic documentation of transport processes, ensuring identical automated input of initial information into the computer network and a gradual rejection of paper documents;

—organizing a unified set of technical devices with a stage-by-stage transition from information networks to information-computer and computer networks;

—working out program devices to ensure the assigned processing and storage of data, the functioning of the computer networks under various conditions and creation of knowledge bases and expert systems.

Automation at all levels of control, specifying joint functioning, coordinated with respect to goals, criteria and data processing methods, of the organizational ASU, ASUTP and devices for local automation, using the necessary means of connection and interaction on a real time scale, will make it possible, essentially, to solve the problem of complete transport process control in railroad transport, from the bottom to the top, for the entire technological cycle—from presenting the freight to transport to delivering it promptly to the recipient, with minimum losses and expenditures.

Goals, Tasks and Potentials

To develop and produce, in extremely short periods, highly efficient means of automation, communication and control systems at various levels and for various purposes, technological processes in train and shunting operations, construction, repair and other sectors of transport, which to a considerable extent determine scientific-technical progress on the railroads, the Soyuzzheldoravtomatizatsiya Scientific-Production Association has been created. It includes the All-Union Scientific Research and Planning-Design Institute of Means of Automation for Railroad Transport (VNIIzheldoravtomatizatsiya), with a branch at Rostov-on-Don, the State Planning-Research Institute for Planning Devices for Automation, Remote Control, Communications and Radio on Railroad Transport (Giprotranssignalsvyaz), the Main Computer Center of the Ministry of Railways, the Planning-Design Technological Bureau of ASUZhT in the settlement of Barybino in Moscow Oblast and the Planning-Design Technological Bureau in Kharkov, as well as 17 electrical engineering plants and the Zheldoreksport Foreign Trade Cost Accounting Firm. The total number of workers in the association is over 17,000.

The association operates as a unified scientific-production complex under the conditions of full cost accounting and self-financing. It operates on the basis of a unified plan and balance. The status and specific conditions for the work of all 22 enterprises and organizations of the scientific production association are determined by the positions and regulations worked out and approved by the association respectively, for each structural unit and each independent enterprise, in accordance with the USSR Law on the State Enterprise (Association). The association is guided in its activity by the requirements of the technical policy carried out by the Ministry of Railways, and organizes the performance of work for each cycle, from scientific research to the practical introduction of its results into the production activity of the railroads and enterprises of the sector.

The economic norms established by the Ministry of Railways for the association for 1988-1990 make it possible to form a centralized fund for the development of production, science and equipment from the association's own profits, mainly sufficient, without drawing in funds from outside, to finance the basic research and scientific projects in progress, create new equipment and improve the production being carried out, modernize production and improve the infrastructure. These conditions of financing determine the directivity of the research introduced, and do not permit unjustified overstatement of the contractual prices for scientific production.

The orientation toward the work conditions of the railroads and the reaction to the needs of the sector in the sphere of development and industrial production of means of automation are becoming the rule and the indispensable condition for all scientific-production activity of the association. Today, quite often, the appeals to the scientific-production associations from the railroads and enterprises of the sector, as well as from other organizations with orders that are major, prestigious and quite advantageous for the association, are ultimately for transport process automation. The work within the framework of the unified scientific-production complex virtually excludes the occurrence, as with the former structure, of mutually unhealthy contradictions between the scientists, designers, planners and producers. This contributes to a reduction in the periods for developing and carrying out a unified technical policy in the sphere of introducing the means of railroad automation, remote control, communications and computer equipment.

Creating the association made it possible to combine science, design work and production into a unified cycle, as well as planning and accompanying the equipment of the automation projects, carrying out contract supervision and start-up and adjustment work, training personnel and turning over "turnkey" objects. This makes it possible to fully eliminate the practice that has formed of planning scientific-research and experimental design work, reduced mainly to a list of its levels and stages, without determining the actual purchasers, volumes and objects to introduce, as well as without sufficient guarantees of the subsequent mass introduction and sale of products (work, services) of the association. In forming these plans, one should be guided by the tasks of eliminating "bottle necks" in the work of roads, regions, junctions, enterprises and other objects of transport, and by the indicators achieved and planned, characterizing a rise in the quality of the transport service.

To increase the effectiveness of using the scientific-technical potential and intensify its influence on the end production indicators, since 1989 the association has undertaken to conclude long-term contracts (agreements) with the railroads and enterprises of the sector for a set of scientific-research, experimental design and planning work, complete deliveries of equipment and putting into operation objects of automation, in close coordination with the contracting work of specialized construction-installation subdivisions of the systems of the Ministry of Transport Construction, as well with the cooperative and other organizations and enterprises of industry and construction.

The structure and status of the association create all the necessary prerequisites for efficient international cooperation, direct ties and combined developments, including the participation of firms of the most developed

countries, and to ensure stable perspectives for the export of the products (services) of the scientific production association. Being a founder, and then a member of the Association of Business Cooperation with the Countries of Latin America, the association will contribute to the development and reinforcement of economic interaction of the enterprises and organizations of the USSR with the organizations and firms of the Latin American continent, and to improving coordination and raising its effectiveness. These countries have a high-capacity market and are promising both from the standpoint of export and import of products according to the specialty of the association and with respect to the potentials for the development of new forms of cooperation (creation of joint ventures, setting up production cooperation, concluding compensatory and commodity exchange transactions, etc.).

In March 1988, by order of the Ministry of Railways, a Memorandum on Scientific-Technical Cooperation between the Soyuzzheldoravtomatizatsiya Scientific Production Association and the West German AEG firm was signed. It specifies ultimately creating a joint venture and can become the real basis for implementing a "technological breakthrough" in providing a radical rise in the quality and competitiveness on the world automation market.

Working under the conditions of full cost accounting and self-financing, the enterprises and organizations of the association achieved a number of successes in 1988. The plan for total work volume was fulfilled by 101 percent, for profit—by 124.6 percent, for production of consumer goods—by 106 percent and for paid services to the population—by 112 percent. Labor productivity at the industrial enterprises exceeded the goal by 8 percent, and in the volume of products supplied for export—by 34 percent.

Despite the results achieved, however, the new conditions of economic activity clearly revealed substantial shortcomings in the work of the association. In the next few years, two basic, to a certain extent interrelated, problems must be solved. These are an improvement in product quality and guarantee of its sale. It has become obvious that the level of scientific research, planning-design and technological developments with the former structure does not always conform to the requirements and perspectives of the sector's development.

Measures were not taken promptly for development and reequipment of the research-laboratory and experimental design base, outfitting industrial production with modern equipment and introduction of the newest technological processes, ensuring stable output of high-quality items. The most critical problem is the reequipment of experimental production facilities and instrument shops and improving the system of technological production preparation.

On the basis of the need to satisfy the demands of railroad transport for the creation and widescale introduction of highly efficient means of automation and control systems for various levels and purposes and advanced technological processes to increase labor productivity and train traffic safety, the workers of the association regard the main object of its scientific-production activity to be the creation and equipment, by railroad contracts, of dispatcher centers for transport process control, equipping the shunting humps with automation devices, developing production and introducing more advanced devices for automation, communications and radio, and automated control systems for technological and production processes. An important role is played by raising the technical level of production, its technological equipment to ensure high-quality output, creation and introduction of automated control systems and monitoring at the enterprises and organizations of the association.

The creative labor of the association's workers is directed toward successful fulfillment of the program for radical modernization of railroad transport, raising the speeds and weights of trains and labor productivity in railroad transport, ensuring traffic safety, and also toward reinforcing international scientific-technical cooperation of the Soviet railroads. This requires the use of all existing prerequisites for increasing production volumes and putting them into practice, increasing the reliability of the technical devices, constantly improving existing and creating new, more efficient means of automation, ensuring a substantial improvement in conditions and raising the labor productivity of railroad transport workers

'Rautaruukki'—Supplier of Transport Means and Systems

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[Article]

[Text] The Rautaruukki firm, a Finnish State Joint-Stock Company which deals with ferrous metallurgy and machine building, was founded in 1960. The foundation of the work of the transport means and systems sector of the Rautaruukki firm was laid with the signing by the firm and the Energomasheksport All-Union Association, on 17 December 1982, of the Agreement on Collaboration for Joint Cooperative Production of Special Freight Cars for the Needs of Soviet Railroads. The first cars were supplied in November 1985, and the delivery of the 5000th special freight car was marked in December 1988.

Today the basic directions in the sector's work on transport means and systems are the development and manufacture of means and complete systems for the transport of various types of freight, as well as the sale of these items, besides that to the Soviet Union, mainly to the domestic market of Finland and the Western European market.

Modern equipment in the production and development of the product

The sector of transport means and systems of the Rautaruukki firm includes four separate production enterprises, the main one of which is the car-building plant at Otanmaki. The industrial equipment was designed by using advanced achievements of technology in this field. The robot equipment and automated equipment for welding are used to the extent determined by the technical-economic substantiation. The sector of transport means and systems is constantly working to improve the goods in production and to develop new items corresponding to tomorrow's requirements. The work is done in close cooperation with the clients, as well as with the scientific-research institutes and enterprises of the sector. Advanced equipment, including equipment for computer-aided design, is used to improve and develop new products.

The efficiency of special freight cars is increased.

So far, the Rautaruukki firm has supplied the USSR with flat-car timber carriers, hopper-mineral carriers, closed autotransporter cars, tank cars for melted sulfur and thermos-tank cars for liquid food products. In addition to the latter, the manufacture of the rest of the types of cars mentioned continues today, but their operating characteristics and economic efficiency have been constantly increased.

A great deal of attention has been paid to reducing the empty-weight coefficient of the cars. In conjunction with Soviet specialists, Rautaruukki is studying the possibilities of using new, high-strength grades of steel for the frames of the welded structure of the freight cars. In this way, an optimum structure can be created for the car, from the standpoint of stresses and deformations, and the empty-weight coefficient improved. The experimental timber-transport flat-car built on this principle is at present in experimental operation on the railroads of the Soviet Union. Prolonged operational tests are making it possible to study the fatigue strength of the flat-car frame and precisely define its operating characteristics under varied operating conditions.

The second problem of interest for any railroad is the overall economic effectiveness of railroad transport. Among the factors affecting this indicator can be named, specifically, the production costs, operating expenditures, input for technical service and the operating characteristics and convenience in unloading. Rautaruukki is engaged in solving this group of problems in close cooperation with Soviet organizations. A good example is the manufacture of a completely new type of mineral-carrier. Through reducing the length along the axes of the automatic couplings and increasing the freight-carrying capacity of the test car, the volume of freight transported was increased by over 10 percent, without lengthening the train consist. The tank car for the transport of melted sulfur, the production of which was begun by the Rautaruukki firm together with the Zhdanov Car-Building Plant in 1988, is also interesting. Today the sulfur-carrying tank car is being manufactured from stainless steel with thermal insulation made of mineral wool and an electric heating system. Because of the complex structure and great expenditure of stainless steel, the production costs are quite high. In addition, the sensitive electrical equipment is easily damaged and the openings for air circulation lessen the efficiency of the thermal insulation. On the basis of the studies of international experience made by Rautaruukki, the firm began to plan a new type of tank car to transport melted sulfur. The boiler of the tank car is manufactured from carbon steel, and an electric heater is used for the steam heating, which has a simple structure. With the introduction of a new structure, the production costs of the tank car will be considerably reduced, and the efficiency of the thermal insulation heightened. As a result, the sulfur will maintain its liquid state considerably longer. Because of this, the need for pre-unloading heating is reduced.

Completely new types of cars

With respect to developing new types of cars, the work of the Rautaruukki firm is directed toward creating special freight cars, particularly needed for mixed freight transport. Mixed transports mean transports of containers, detachable bodies, autotrains, and trailers for various types of transport, usually motor vehicle and railroad. The importance of mixed transport grows increasingly with the increased complexity of the problems of congestion in motor vehicle transport and the adverse effects of autotrains on the environment.

Of the cars designed for mixed transport, the Rautaruukki firm offers the English customer flat-car container-carriers with a loading length of 60 feet and a load-carrying capacity of 62.5 tons. Because of the exceptionally small dimensions of England's railroads, the flat-car is built with a special structure, so that the height of the freight platform is only 1000 mm, but at the same time, the ability to couple with other cars is ensured.

A flat-car for semi-trailer transport, developed by the Rautaruukki firm for the British buyer, has aroused the broadest interest on an international scale. The basic idea lies in creating a flat-car, the loading and unloading of which can be done with a single source of motive power, without using hoisting mechanisms. This makes it possible to perform the loading and unloading of the flat-car even at the smallest railroad stations, where there are no expensive cranes and motor freight terminals. The idea is carried out by equipping the middle part of the flat-car with a box-section, which turns sideways hydraulically, and light-structured hoisting ramps, along which the semi-trailer can be rolled in reverse onto the platform. The two-axle experimental model of the flat-car, with an overall weight of 45 tons, is now under experimental operation in England. At the same time, the Rautaruukki firm is now working on a flat-car, similar in principle, which is installed on a bogie.

For Finnish railroads, Rautaruukki has developed an all-purpose flat-car for mixed transport. Containers, detachable bodies and wheeled means of transport can be shipped on this flat-car. The flat-car width is only 2500 mm and the height of the freight area is 1100 mm. Because of this, the flat-car can be rolled under the detachable bodies standing on their supports. The flat-car can be equipped with a hydraulic mechanism, by means of which the detachable bodies can be moved along the consist. The flat-car is equipped with a shortened coupling system, which permits the transfer of the transport means from one flat-car to another. In addition, detachable ends can be specified in the flat-cars, which make it possible to couple them with a different consist. The flat-cars are estimated at an axle load of 18 tons and a load-carrying capacity of 50.5 tons.

To transport granular freight in consists with a circular service, a "torpedo" car has been developed, the unloading of which is implemented when the consist moves at a speed of about 2 km/hr. The car is particularly suitable for transport of sand and other heavy granular freight. The emptying of the car from the "torpedo-shape" capacity is ensured through its rotation around its long axis by means of a guide roller. It is loaded normally, from the top. The load-carrying capacity of the experimental model of the "torpedo" car constructed is 66 tons, with an empty weight of 22 tons.

Other Transport Equipment Items

In container transport, increasingly wide use is made of 40-foot containers, which cause problems when processing outside major container terminals. Rautaruukki has built a prototype of a semi-trailer, which, by means of hydraulic drive, can lower to the ground and pick up from the ground a 40-foot container. In the loading and unloading period, the running gear of the trailer moves to the rear section of the drive in such a way that only an 11° slope of the container is formed. This system makes it possible to lower the container, in principle, onto any spot without damaging its freight. In the near future the Rautaruukki firm will begin manufacture of an experimental series of these semi-trailers for normal delivery of freight to the consumers.

Rautaruukki has developed a "Wheelles" wheelless transport system to process freight at ports. The system includes a "Transflat" transport pallet and a hydraulic bogie, positioned by means of a tractor, for hoisting-transport operations of the "Translift" type, by means of which the pallets are transported from the port onto a Ro-Ro ship and in the opposite direction. The wheelless transport system replaces the formerly used, expensive roll-trailer system and accelerates loading and unloading of Ro-Ro ships in ports. In addition to ports, the wheelless transport system has proven itself in intra-plant transport.

Based on the use of electronics, the system of transmitting information and calculation of freight traffic is also rapidly spreading to the sphere of freight transport. Rautaruukki has concluded an agreement with the American firm, Amtech Corporation, on the sale of the so-called satellite memory system in Scandinavia and the Soviet Union. The system includes small electronic transmitters, which are installed on containers, railroad cars, truck trains, etc. Specific information is recorded in these transmitters. In addition, the system includes identification devices, installed on the traffic routes. These instruments help to record the passage of cars or truck trailers along the run. The basic equipment can in practice be used in various ways. One of the ways that can be mentioned, for example, is automated control of mechanisms to load ore, which allow for the load-carrying capacity of the cars. In the future the system will be expanded, for example, through including a detector system in it, i.e., determining the location by using satellites.

Cooperation with clients continues on the basis of close ties

The Rautaruukki firm has favorable experience in the sphere of close cooperation with clients. On the basis of the comments, testimonials and wishes of the clients, items have been developed which to the greatest extent meet the requirements of the clients and their aim of increasing the economic effectiveness of transport. In addition, the sector of transport means and systems of the Rautaruukki firm has joint projects with Soviet organizations, particularly in the sphere of automation and robotization of car production.

The next "Railroad Transport-89" exhibition in Shcherbinka will be held from 23 May to 2 June 1989. The sector of transport means and systems of the Rautaruukki firm will exhibit here not only many of the above-mentioned new equipment models, but also many other items. We invite inspection of the exhibits of our Rautaruukki firm.

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